AD-A079 901 WEATHER SQUADRON (30TH) YONGSAN (REPUBLIC OF KOREA) --ETC F/G 4/2
TERMINAL FORECAST REFERENCE NOTEBOOK.(U)
NOV 79

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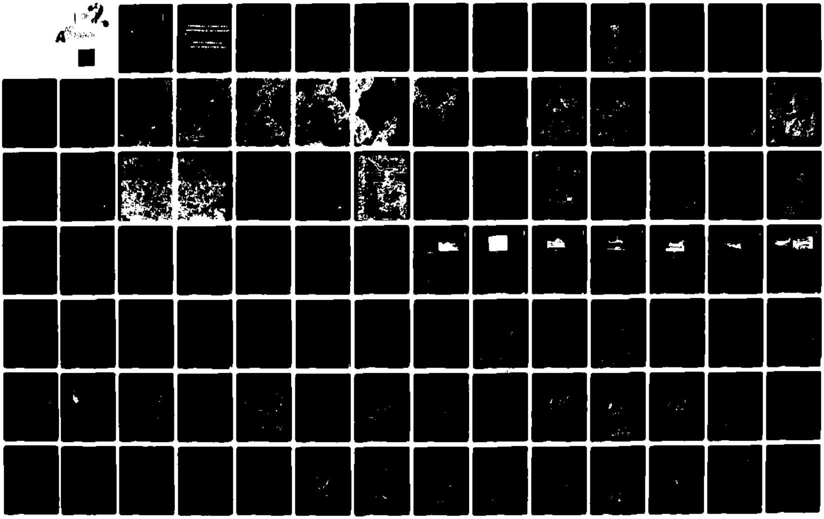

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Terminal Forecast Reference Notebook
Detachment 18 30th Weather Sq.
7 Nov. '79

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TERMINAL FORECAST REFERENCE NOTEBOOK

DETACHMENT 18
30TH WEATHER SQ

YONGSAN AI, KOREA

Preparation Date 7 NOVEMBER 1979

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SECTION A

LOCATION, TOPOGRAPHY, AND LOCAL EFFECTS

A - 1

KOREA

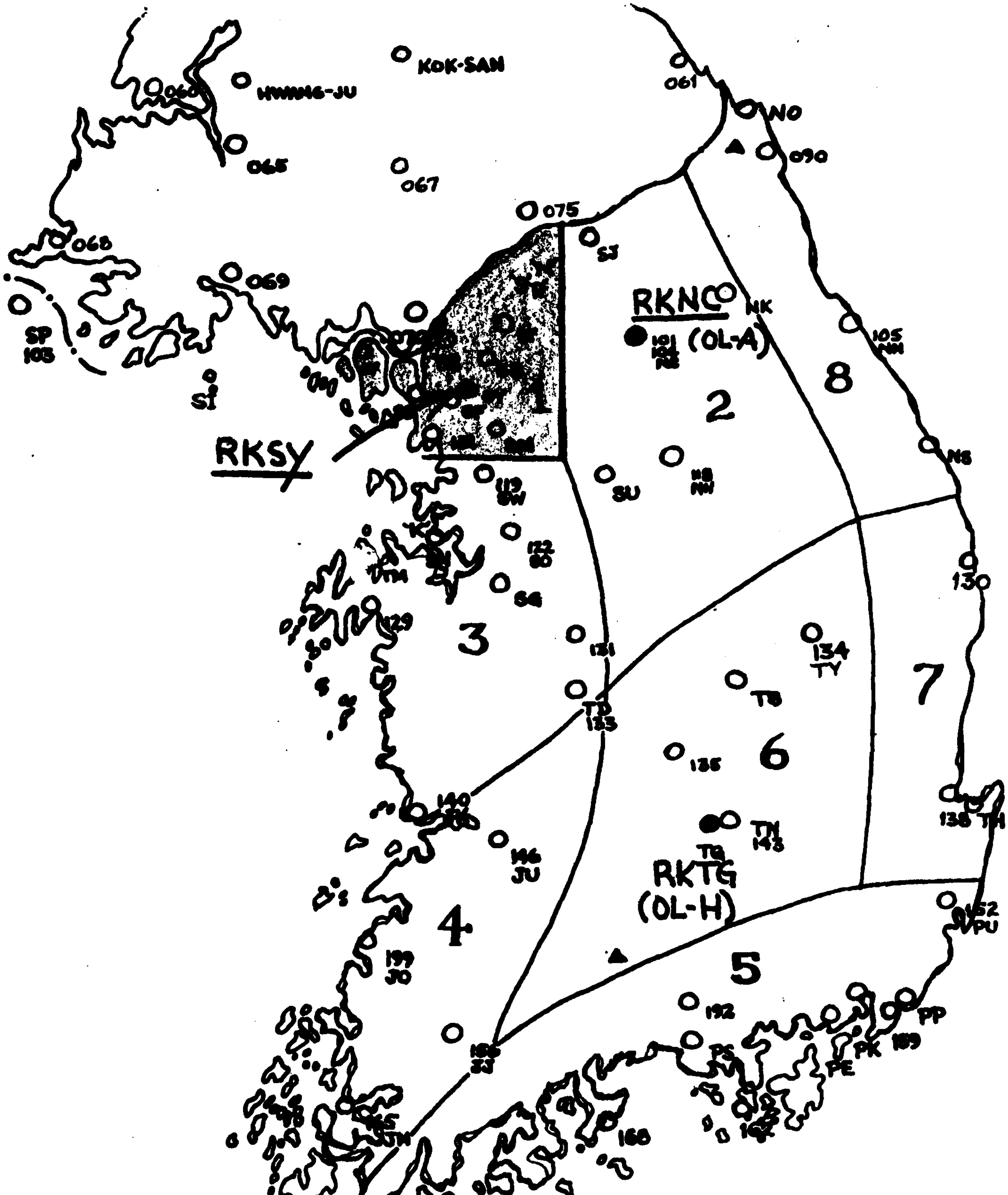
A-1 KOREA

1. Geographical Location and Topography of the Republic of Korea: The Republic, about the size of Indiana, covers 37,700 square miles. The climate of Korea is largely influenced by the world's largest land mass to the west and by the Pacific, the worlds largest ocean, to the east.

a. The peninsula is bounded to the east by the East Sea (also known as the Sea of Japan), to the south by the Korea Strait (also known as the Straits of Tsushima), and to the west by the Yellow Sea. There are numerous rivers and smaller streams throughout the country. The largest river, the Han, consists of two major branches. The Puk (north branch) Han originates in the mountainous Kangwon-do province in the northwestern portion of the Republic. The Puk Han flows southwestward to Seoul where it is joined by the Nam (south branch) Han river. The Nam Han originates in Chungchong-Pukto province in the central portion of the country. From Seoul, the Han flows northwestward and empties into the Yellow Sea. The Imjin river, also in the northern portion of the Republic, originates in north Korea. It flows southwestward along the Demilitarized Zone (DMZ) and joins the Han River about 20 miles northwest of Seoul. The Naktong River, which drains the relatively broad interior valley in the southern part of the Republic, originates from lake Andong in the east-central province of Kyongsang-Pukto. From there, the Naktong river flows southward and empties into the Korea Strait, just west of Pusan. Industry in Korea is still primarily agricultural with rice paddies throughout the nation providing a large moisture source during the summer months.

b. The Republic of Korea extends from north Korea, roughly along the 38th parallel, to 34°N (excluding Cheju Island). The terrain of Korea is irregular and, in general, very rugged. The major terrain feature is a long mountain chain, the Taebaek mountains, which extend longitudinally along the entire length of the peninsula. This mountainous backbone lies closer to the east coast than the west with peaks rising over 5000 feet in the central and southern parts. To the east, the mountains drop steeply to the coast. There is a more gradual decrease in elevation west of the range. Numerous rugged hills (peaks to 3000 feet) extend to the western coastline. The western and southeastern sectors of the nation consists of hills and plains which support most of the Republic's agricultural industry.

US Navy Tech Report 77-03, The Environment of South Korea and Adjacent Sea Areas, in the unit TFRF, is an excellent reference for this subject.


KOK-SAN
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3
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7
TB
6
RKTG
(OL-H)
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5
192
PP
PK
PE
168

ATCH 1.

A - 2

AREA I

A-2 AREA I

1. General: Most flights briefed by Det 18 are within or in close proximity to Area I. For this reason, Det 18 personnel must become extremely knowledgeable of Area I.

2. Location and Background: The ROK is divided into eight areas. ROK area one is located in the northwest corner of the Republic of Korea. The DMZ is the northern boundry. Multiple mountain chains are on the east. To the south are a set of low hills which extend from the south-east corner of the area to the Yellow Sea. The bay just to the west of Area I is Kyunggi bay. Most major Army flying units, command sections, and the highest density of population is within this area. The historical invasion route from the north goes southward through the heart of Area one.

a. Of major strategic interest to the ROK is the defense of the demiliterized zone. The mid-demarcation line (MDL) separates North and South Korea. It extends 150 miles from the Yellow Sea to the East Sea. The DMZ extends 2000 meters north and south of the MDL. Troops may not fortify positions within this area.

b. There are seven Buffer Zones that extend the length of the DMZ. Four of these are within Area I (See Atch 3). The Buffer Zone (BZ) is a strip about five miles wide extending the length of the MDL. It is an area of restricted flying.

(1) BZI - BZ one is the western-most zone. The western portion of the zone begins on the Han River delta. The terrain is approximately half rice paddies and tidal mud flats of the Han River estuary and half hills. Three major islands are within BZ I. Gyodong is the smallest and western-most. It has an average elevation of 150 feet and one isolated peak of 1200 feet. The Songo River separates Seogmo and Gyodong Islands. Seogmo is about 20% rice paddy. Ganghwa is the largest of the three islands. It's average elevation is 500 feet with one peak of 1500 feet. This island has relatively rough terrain. The Yom-ha River separates Ganghwa island and the mainland. The confluence of the Imjin and Han River is the boundary for BZ I and II.

(2) BZ II - This Buffer Zone is the most critical BZ because of presence of the Joint Security Area (JSA). The JSA is where the Armistice Commission holds "peace talks" with the North Koreans. The western edge of the BZ II begins on the Imjin River and is relatively flat and extensively covered by rice paddies. The eastern half has rougher terrain with ridges of two to three hundred feet.

(3) BZ III - This zone is 24 miles long. The western half is hilly and averages 600 feet with only a few streams. Over the eastern half the elevation increases to the peak of Chondk-San which is about 2000 feet. Then it decreases to the northern edge of the Chorwon valley. There are numerous rice paddies and relatively flat terrain in the northern portion of the Chorwon valley.

(4) BZ IV - This zone is nine miles along. The western part is

relatively flat with a dam and numerous rice paddies. The hills average 1500 feet and are concentrated in the eastern two-thirds of the zone.

c. TAC Zones: The P518 control area extends south from the BZ and extends from coast to coast. It is broken into three zones which are refered to as TAC Zones (TZ) A, B, and C. The purpose of the P518 control area is to outline the initial zone of conflict if an invasion took place. (See Atch 3) The TAC Zones are used for training. Tactical helicopters will fly 600 feet or lower in combat so training missions fly at the same altitude or lower. They can fly at a higher flight levels. The TAC Zone has minimum helicopter conditions of 500 feet during the day and 1000 feet after sunset. The visibility requirements are one mile during the day and three miles after sunset.

(1) TAC Zone A covers the northwestern edge of the nation. It coincides with the northern two-thirds of ROK Area One and a small portion of the northwestern portion of Area Two. TZ A has the most Army aircraft activity.

(2) TZ B covers the central interior zone in ROK Area II. The terrain is very mountainous.

(3) TZ C covers the northeastern coastal range of mountainous and the coastal areas. This area coincides with the northeastern portion of ROK Area Two and the northern on half of ROK Area Eight.

d. Navigational Routes: The Army has standard routes of flight that are used for control and safety of aircraft. These are not the only paths of flight for Army aircraft; however, they are the most common. The standard routes are red route, yellow route, green route, route direct, the Seoul Pusan highway, and the PAPA 73 restricted zone (Atch 4).

(1) Red - Red route originates at R238 along the BZ. It follows Korean road "3". Mountains along the east side of the route average 400 feet. Seven miles south, the route enters the "Little Chicago" area. "Little Chicago" is an Army rearrangement of the Korean town's name of Chon Gong Ni. The Korean airfield of R227 is near the town. The Little Chicago area is the junction of two rivers within a mountain valley. From Little Chicago the route extends south through the Sin Cho On (River) valley to Tongduchon (Camp Casey). The valley is 6 miles long and 1 mile wide; terrain on either side of the valley averages 1800 feet.

The "Triple Duce Valley" is located south west of Camp Casey. The valley is about 5 miles across. Its floor is covered with 100 to 200 foot ridges. Six miles either side of the center of the valley, extending north through northeast, the terrain averages 2000 feet. A 1300 foot ridge begins about 2 miles from the center of the valley and extends 5 miles southeast with terrain averaging 1500 feet. From the Southwest through northwest the terrain is covered with ridges which average 800 feet or less.

The route from Camp Casey and 12 miles south to Uijongbu is relatively flat except for a ridge along the western edge which averages 1500 ft.

The route is over rice paddies and near several military bases. "Jackson's Pass" is west southwest of Uijongbu and is a major entrance to red route. Red route follows road 312 through Jackson's Pass. The mouth of the pass lies 3 miles west-southwest of Uijongbu between Tobongsan and the mountain on which FOC-N (Flight Operations Center - North) is located at 1535 feet. The Jackson's Pass valley extends to the southwest.

The route from Uijongbu to the northeastern edge of P73 follows the valley of the Chungyang-Chon (River). The route passes between Tobong-San (2352 feet) and Surka-San (2011 feet).

The red route parallels the eastern edge of P73 restricted zone until it reaches the Han River. It then turns down-stream until it reaches the Bridges East area.

(2) Yellow Route - Yellow Route begins at R 237 near the south-eastern edge of the Chorwon Valley, 6 miles south of the BZ. The Chorwon Valley is a relatively flat valley 6 miles wide. It is covered with rice paddies, small streams and several small lakes. Mountains average 2200 feet within 2 miles east through 6 miles west of R237.

Proceeding south along road "43", the terrain within one mile of the route averages 1500 feet. Nine miles south stands Kwanum-San on the eastern edge of the route with an elevation of 2405 feet. At this point there is a small valley where the route picks up the Pochon (River). Once the route picks up the Pochon, the valley widens to about 4 miles. The valley floor is covered with rice paddies. Terrain 3 miles east ot the route averages 1800 feet. Terrain along the western edge of the valley for the first four miles averages 1700 feet. From a point four miles south of the northern part of the Pochon valley, the terrain averages 2000 feet within 2 miles west of the route. Yellow route terminates at Uijongbu.

(3) Route Green is more commonly referred to as the "A and B" valley. The name is derived because the route follows the dividing line between TAC zones "A" and "B".

The route begins at R316 which is about 2 miles south of the BZ. The route proceeds south along road "391" and a small nameless stream. The valley is about 1/2 mile wide; terrain within 1/2 mile averages 1000 feet and within 1 mile the terrain averages 2000 feet. About 10 miles south of the starting point the route hits a summit very near the location where the route passes from Kangwon-do (province) to Kyonggi-do (province). The highest point along the valley floor is about 700 feet. Kwangdok-San (3429 ft) over-looks the pass.

The route heads south along the edge of "Nightmare" range and into a valley 7 miles south of the summit. The valley is relatively deep with terrain reaching 1700 feet within 2 miles.

A high mountain valley is formed for 9 miles south-Southwest along road "391". The valley is 4 miles wide and covered with streams and rice

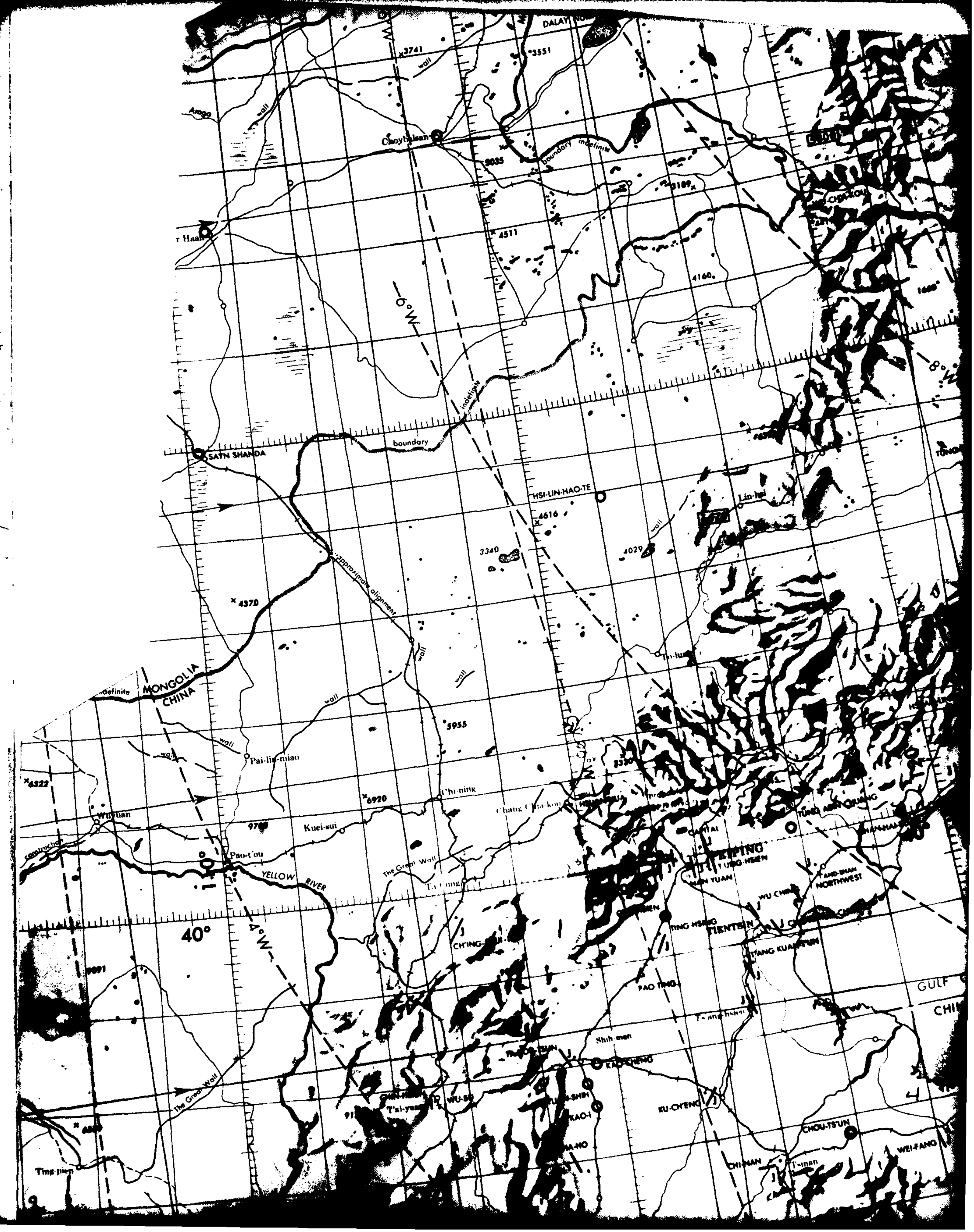
paddies. The terrain within 2 miles west reaches an average of 3000 feet along the valley. The terrain along the western edge averages 2000 feet within 2 miles. The southern edge of the route runs along a 1200 feet ridge which separates this valley from the Pochon valley. The valley is 8 miles long. Terrain within 1/4 mile reaches about 1000 feet and within a 1/2 mile the terrain reaches about 2000 feet. Two miles north-northeast of R203 the deep valley opens. Mountains along the eastern edge still average 2000 feet but lie 4 miles to the east. The terrain to the west decreases significantly. Terrain within 4 miles to the west averages 1000 feet. The valley consists of fields and rice paddies. The route heads south east from R203 to the Han River and it terminates at the Venturi Pass.

(4) Route Direct begins at Uijongbu and terminates at Chunchon. This route is a direct line between these two spos. The terrain is mountainous with elevations of 600 to 2700 feet.

(5) The Seoul Pusan highway begins at the Bridges East area. Bridges East is a check point in the navigation of the P73 restricted zone. The Seoul Pusan highway is a four lane road that heads south from Seoul towards Osan. In area one, the terrain is covered with hills averaging 500 feet. The highest elevation along the route in Area One is about 3000 feet, near the southern boundary.

(6) PAPA 73 is restricted control zone around the city of Seoul and all the governmental/military headquarters located within the city. P-73 is about five miles in radius, and aircraft normally pass around P-73 when flying to other destinations. Those flying within P-73 do so with expressed permission. Aircraft entering this area without permission, run the risk of being shot down. PAPA 73B is a larger circle around Seoul. Aircraft entering will receive a radio message to exit the area and might receive a warning shot to clarify the point. The PAPA 73B perimeter is the line around which aircraft navigate when they are flying near Seoul. The H-201 heliport and "E" pad (of the hospital) are not within the restricted area. Howover they are the boundary lines.

The city of Seoul lies within P-73 on the plain of the Han River. The city's population is approximately seven million. With industry, home heating systems, and automobile traffic, Seoul has an abundance of pollution sources.



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3741
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8°W
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HSI-LIN-HAO-TE
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Lin-hsi
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4029
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4370
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MONGOLIA
CHINA
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Wu-yuan
Kuei-sui
Chang Chia-kou
construction
Pao-t'ou
YELLOW RIVER
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The Great Wall
Ting-pien

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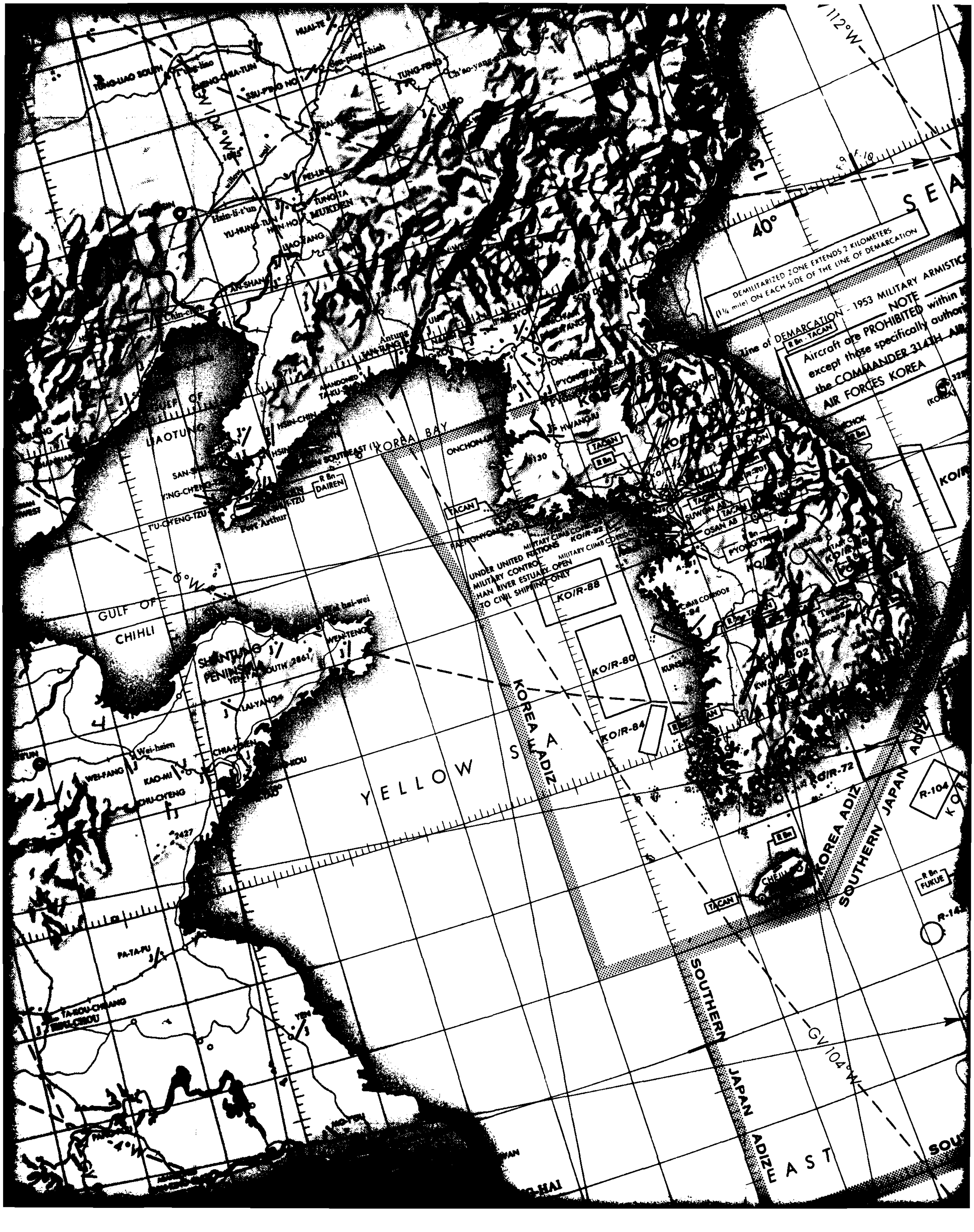
HSU-CHOU
SAN-YUAN
YEN-LIANG
CHANG-KO
125
Nan-yang
NAN-YANG
1250

NOTE
Aircraft are PROHIBITED within KO/R-518
except those specifically authorized by
the COMMANDER 314TH AIR DIVISION
AIR FORCES KOREA
MILITARY ARMISTICE 1953
DEMILITARIZED ZONE EXTENDS 2 KILOMETERS
ON EACH SIDE OF THE LINE OF DEMARCATION
line of DEMARCATION
UNDER UNITED NATIONS
MILITARY CONTROL
HAN RIVER ESTUARY OPEN
TO CIVIL SHIPPING ONLY
YELLOW SEA
KOREA ADIZ
SOUTHERN JAPAN ADIZ
CENTRAL
NORTHERN
KOREA STRAIT
SEA
GULF OF LIAOTUNG
GULF OF CHIHLI
KOREA BAY
SHANTUNG PENINSULA
GV 112°W
GV 104°W
40°
130°
HARBIN
CH'ANG CHUN
MUKDEN
TA-FENG-SHEN
HUAI-TE
T'ao-an
ABANDONED T'AO-NAN
TUNG-LIAO SOUTH
TUNG-FENG
KAI-YUAN
PEI-LING
LIAO-YANG
AN-SHAN
Antung
DAIREN
Port Arthur
YING-CH'ENG-TZU
T'U-CH'ENG-TZU
ONCHON-UP
HWANGJU
PYONGYANG EAST
SUWON AB
OSAN AB
KUNSAN
SAMCHOK
TACAN
KO/R-88
KO/R-80
KO/R-84
KO/R-74
KO/R-72
R-104
R-134
Wei hai-wei
WEN-TENG
LAI-YANG
Wei-hsien
WEI-FANG
KAO-MI


SEA
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DEMILITARIZED ZONE EXTENDS 2 KILOMETERS
(1¼ mile) ON EACH SIDE OF THE LINE OF DEMARCATION
NOTE
AIR FORCES KOREA
112°W
KOREA BAY
LIAOTUNG
GULF OF
CHIHLI
SHANTUNG
PENINSULA
DAIREN
Port Arthur
MUKDEN
UNDER UNITED NATIONS
MILITARY CONTROL
HAN RIVER ESTUARY OPEN
TO CIVIL SHIPPING ONLY
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KO/R-80
KO/R-84
KO/R-72
R-104
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KOREA ADIZ
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JAPAN
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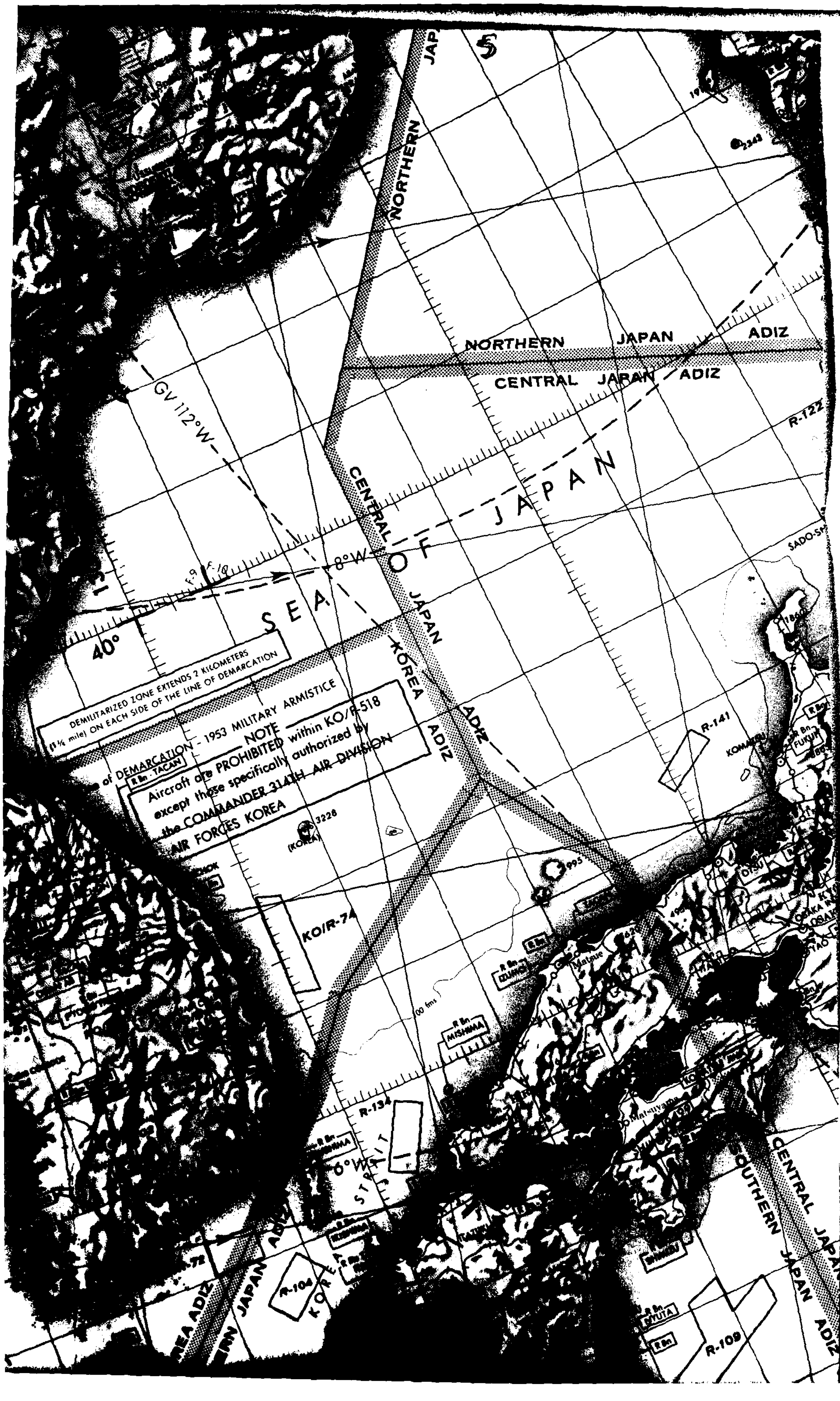
GV 104°W
EAST


NORTHERN JAPAN ADIZ
CENTRAL JAPAN ADIZ
SEA OF JAPAN
GV 112°W
8°W
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F-9
F-10
R-122
R-141
R-134
R-104
R-109
KO/R-74
DEMILITARIZED ZONE EXTENDS 2 KILOMETERS
(1¼ mile) ON EACH SIDE OF THE LINE OF DEMARCATION
of DEMARCATION - 1953 MILITARY ARMISTICE
NOTE
Aircraft are PROHIBITED within KO/R-518
except those specifically authorized by
the COMMANDER 314TH AIR DIVISION
AIR FORCES KOREA
R Bn - TACAN
3228
(KOREA)
KOREA ADIZ
CENTRAL JAPAN ADIZ
SOUTHERN JAPAN ADIZ
KOREA STRAIT
SADO-SH
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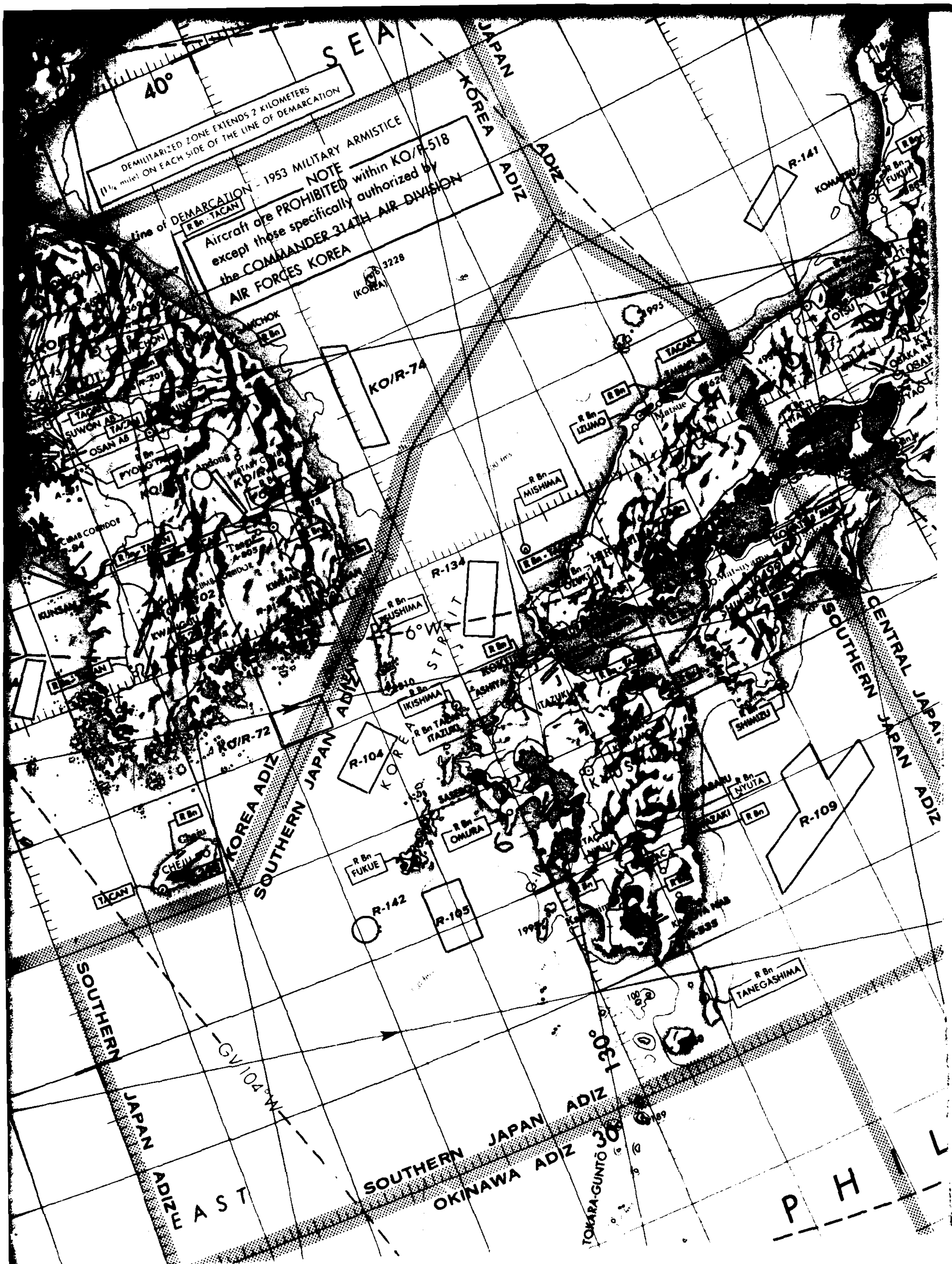
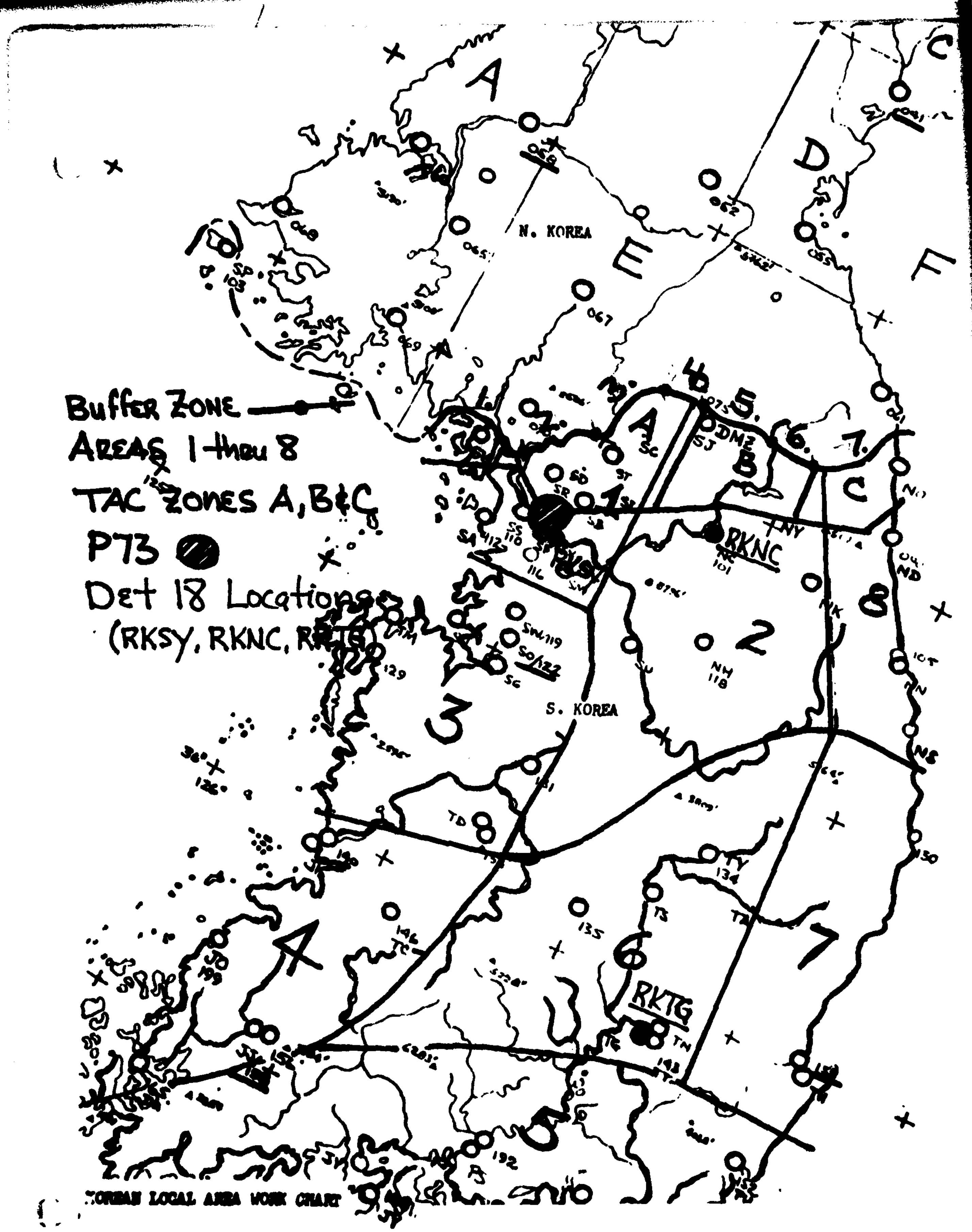
KOMATSU
FUKUI
995
Matsue
MISHIMA
100 fms
Matsuyama
5

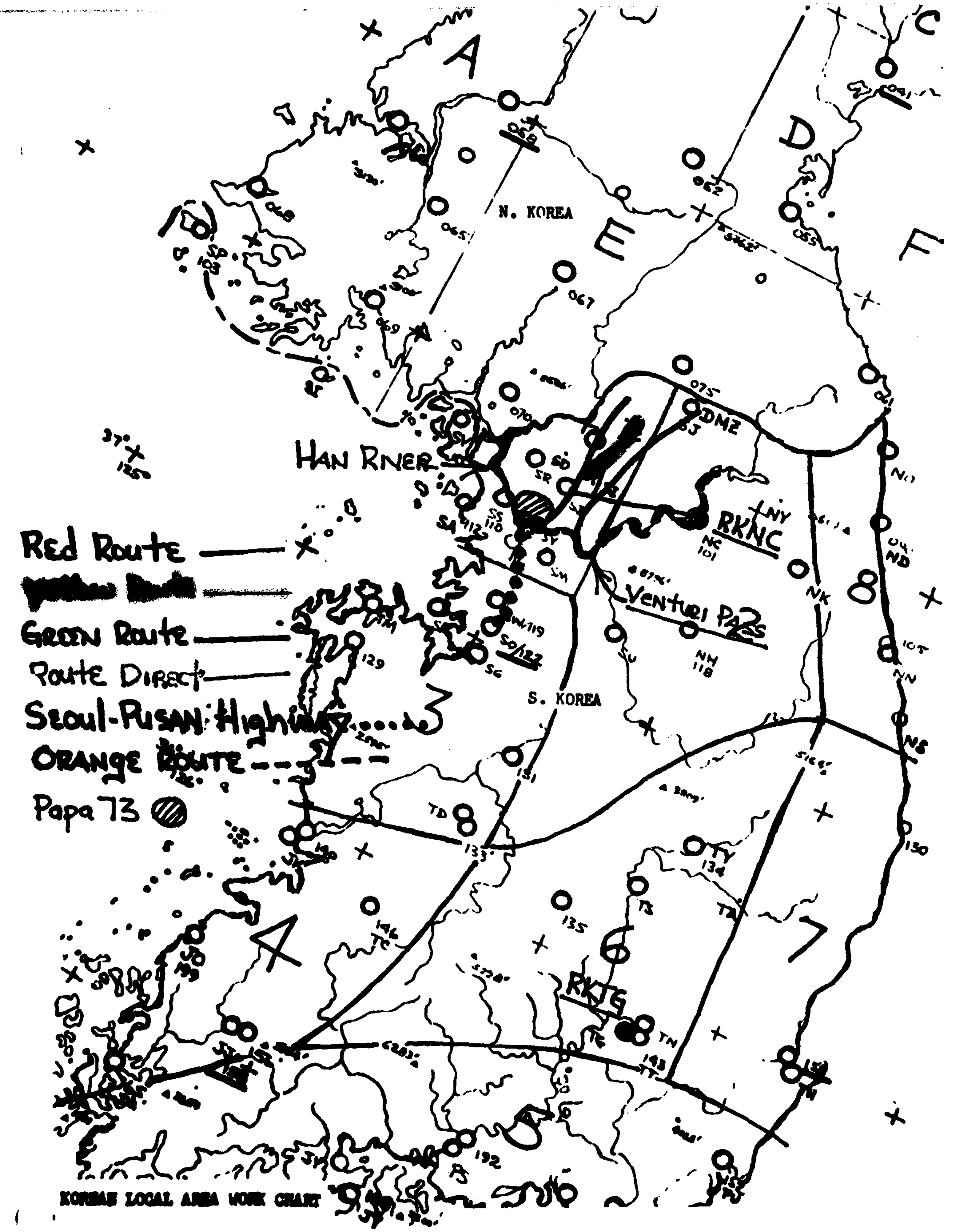

SEA
40°
DEMILITARIZED ZONE EXTENDS 2 KILOMETERS
(1¼ mile) ON EACH SIDE OF THE LINE OF DEMARCATION
Line of DEMARCATION - 1953 MILITARY ARMISTICE
NOTE
Aircraft are PROHIBITED within KO/R-518
except those specifically authorized by
the COMMANDER 314TH AIR DIVISION
AIR FORCES KOREA
JAPAN
KOREA
ADIZ
KO/R-74
R-141
KO/R-72
R-134
R-104
R-142
R-105
R-109
KOREA ADIZ
SOUTHERN JAPAN ADIZ
CENTRAL JAPAN ADIZ
SOUTHERN JAPAN ADIZ
OKINAWA ADIZ
EAST
PHIL
130°
30°
TOKARA-GUNTO
TANEGASHIMA
FUKUE
OMURA
IKISHIMA
TSUSHIMA
IZUMO
MISHIMA
SHIMIZU
NYUTA
TACAN
SUWON AB
OSAN AB
GV 104°W
KOREA STRAIT

1 : 5,000,000 map of
China-Korea-Japan

ATCH 2.


Buffer Zone
Areas 1 thru 8
TAC ZONES A, B&C
P73
Det 18 Locations
(RKSY, RKNC, RKTG)
N. KOREA
S. KOREA
RKNC
RKTG
DMZ
KOREAN LOCAL AREA WORK CHART

ATCH 3.



KOREAN LOCAL AREA WORK CHART

ATCH 4.

A - 3

YONGSAN

A. 3. Eighth Army Garrison, Yongsan (H-201), Seoul & Det 18, 30WS

H-201 - Location: 37°32'N 127°00'E (CS230548)
Elevation: 49'

Det 18, 30WS - Location: 37°33'N 126°59'E (CS226558)
Elevation: 149'

Det 18, 30WS; Hq, 30WS

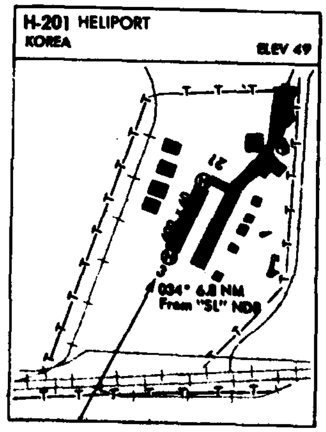
The Yongsan heliport is located on the south-central edge of Seoul 200 yards north of the north shore of the Han River in a slight depression along the banks. It is on the southern extremity of the South Post of the U.S. Army Garrison, Yongsan.

Terrain rises gradually to the north to the small peak, 152', on Main Post for which the Garrison is named - Yongsan or Dragon Mountain. The terrain continues to rise to peak at Nam-san, or South mtn., at an elevation of 825', a landmark in southern Seoul with its soaring broadcast tower and observation platform atop the mountain.

To the east there is a small north-south ridge of 80'-120' that rises gradually through the city to the southeast flank of Nam-san. South the Han River stretches out for 1200 yards and the terrain south of the river is relatively flat for another three miles where hills start, peaking at Kwanak-san at 2133' at six miles. To the south west lies the major suburb of Yongdung-po and to the west and north west, the broad flat Han River valley with terrain relatively flat for 10 miles or more.

High rise buildings of 5-15 stories along the ridge to the east, multiple ranks of 10-12 story apartment buildings 2-3 miles east and west along the south bank of the Han and 8-10 story apartments to the west on the north bank enhance the impression of the helipad being in a bowl.

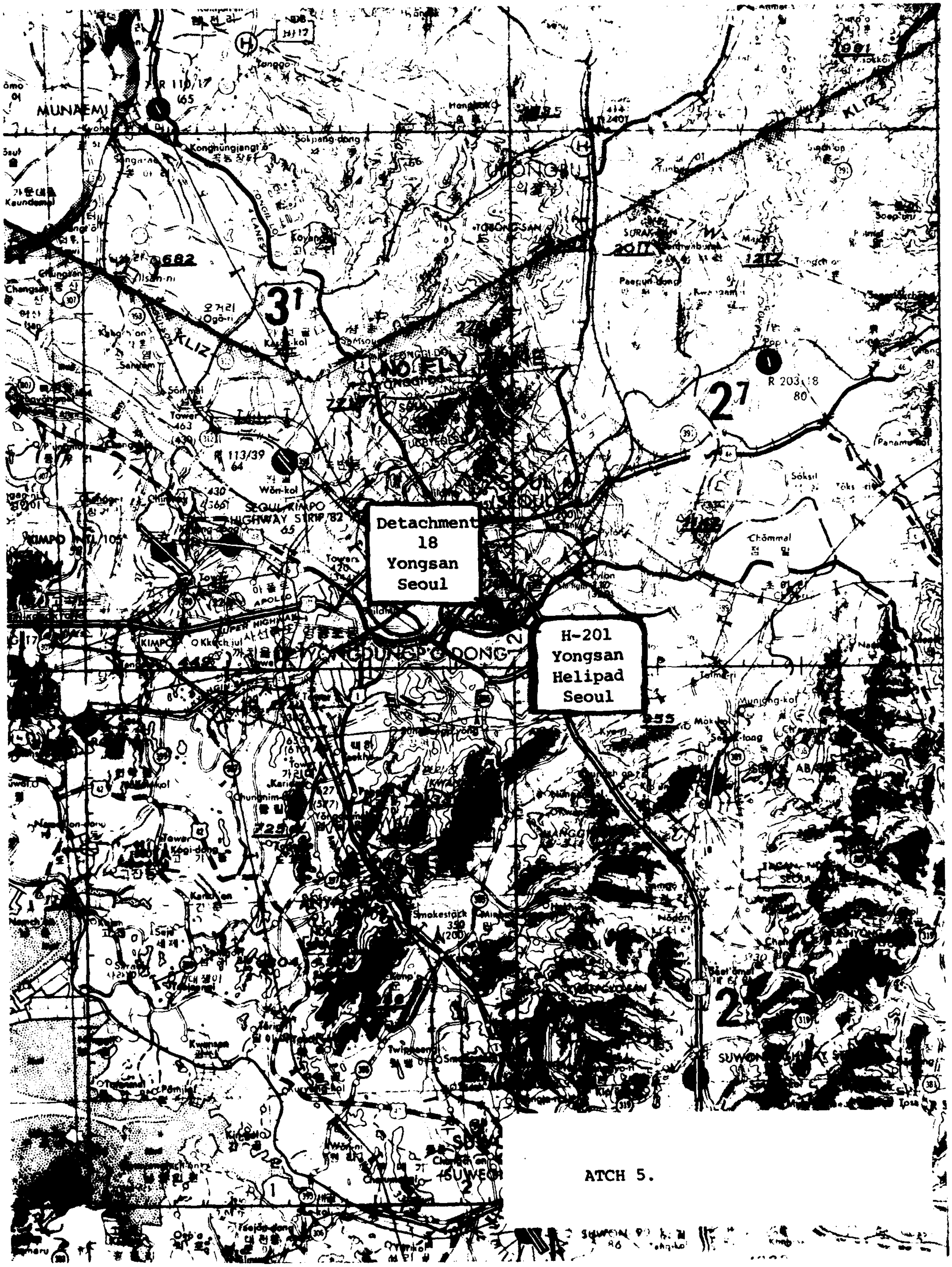
Railroad marshalling yards, sand and gravel crushers, cement factories and other industry between the helipad and the river contribute excessive pollutants. The northern terminus of the Seoul-Pusan expressway is one mile east with two other major traffic arteries immediately east and south of the helipad. One mile southeast is the Seoul southern bus terminal and two major traffic arteries run along the south bank of the Han. The resultant air pollution is the major visibility factor nearly every day of the year.



The Base Weather Station is located 1 mile north of the H-201 helipad on Yongsan (Dragon Mtn) on the north side of main post, the highest point on the garrison. Nam San, 1 mile to the north is the only obstructing terrain within 5 miles.

Helipad (H-201), 03-21, 40'X400', Asphalt.
Operations and weather station at far northeast corner of heliport.
Weather Radar and FM Pilot-Metro Service available.

Pg 10



Detachment
18
Yongsan
Seoul
H-201
Yongsan
Helipad
Seoul
NO FLY ZONE
MUNAEMI
KLIZ
R 110/17
65
R 203/18
80
R 113/39
64
SEOUL KIMPO
HIGHWAY STRIP 82
65
KIMPO INTL 105
Smokestack
350
(200)
SUWON

ATCH 5.

A - 4

CAMP PAGE

A. 4. Camp Page (A-306), Chunchon

Location: 37°59'N 127°43'N (CS8792)

Elevation: 243' OL-A, Det 18, 30WS

Chunchon is situated in the north central portion of the Republic of Korea (R.O.K.) in Kangwon-do (province) where the Soyang-gang (river) joins the north branch of the Han River (Pukhan-gang).

There is a major hydro-electric dam 3 1/2 nautical miles SSW. The dam's impounded waters form a lake 7 miles long and over 2 miles wide that surrounds the airfield to south, west and north.

Terrain is very rugged throughout the area. The west shore of the lake, 2 1/2 miles away, rises abruptly to 1000, peaks briefly at Pukpae-san (2815') 7 miles WNW, then rises steadily to a NNE-SSW ridge (3000'-4800') 13 miles away.

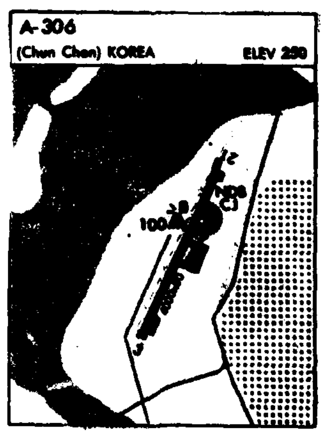
The area to the north alternates between valleys (600 to 4000') and rough ridges of 1600'-3900'.

Eastward 3 1/2 miles, the valley plain rises abruptly to 1500'. Ten miles away is another NNE-SSW ridge of 2400'-3000'.

To the south there is a conglomerate of disorganized hills and valleys with peaks generally in the 1300'-1700' range. The hills extend to the Hwayang-gang valley 15 miles away.

The Pukhan-gang flows from the dam through a convoluted and narrow valley and then all the way to the Seoul City limits.

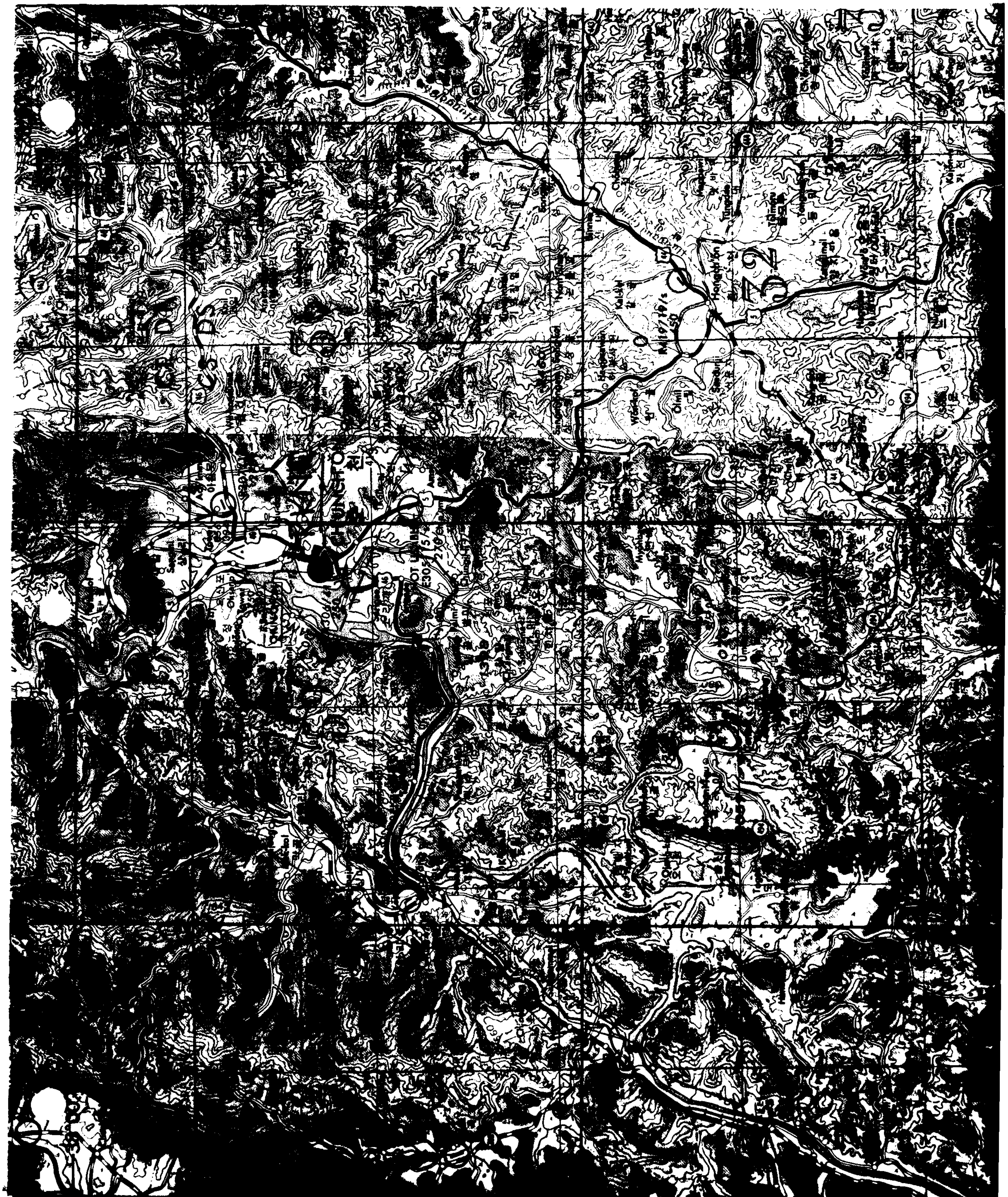
The city of Chunchon is due east of the airfield. There is extensive low flat farmland, mostly rice paddies, to the north, east and south. The city is not heavily industrialized being primarily a summer resort and rail terminal; therefore, air pollution is not a serious problem.

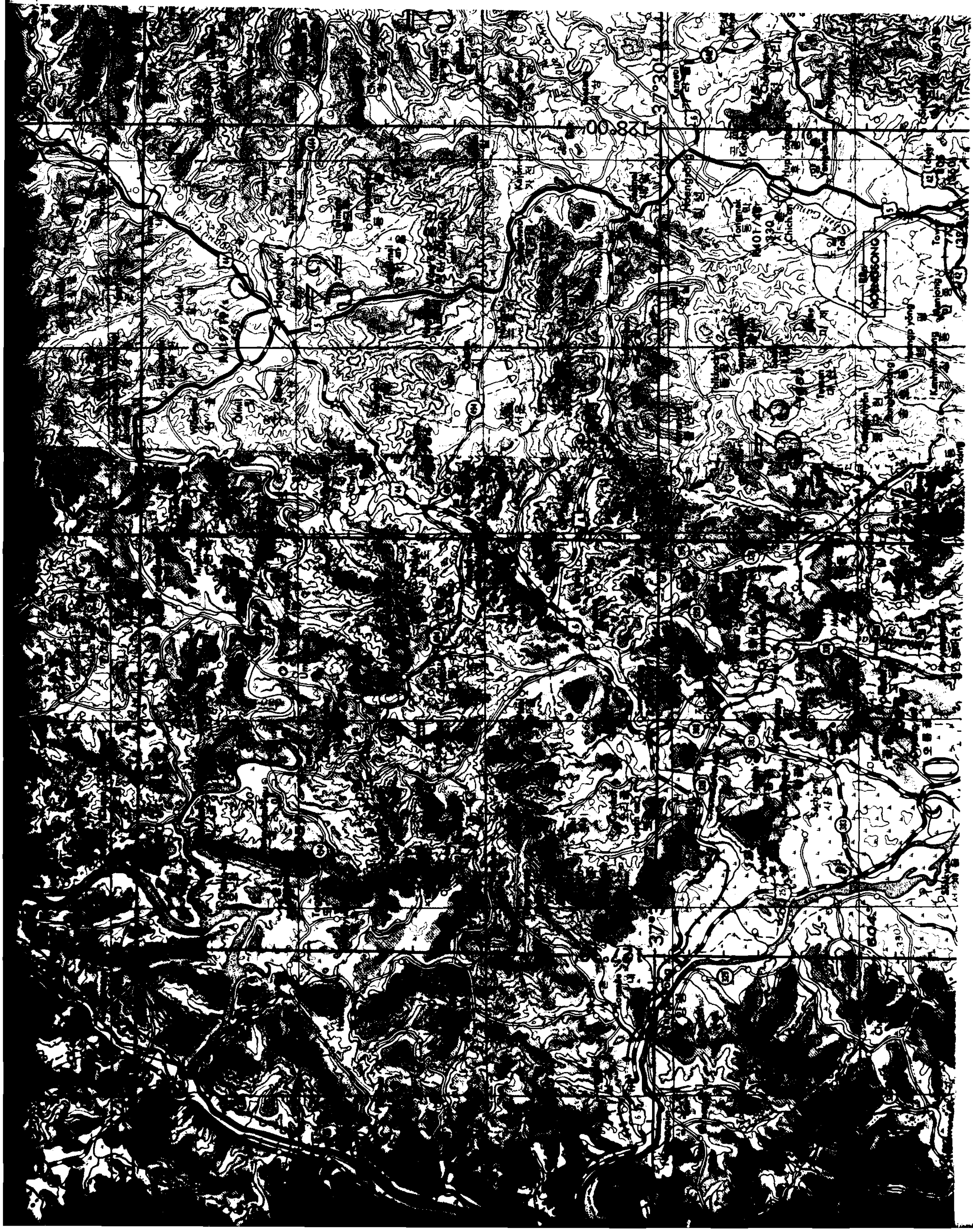


The area is protected by the surrounding mountains in the colder months from all except major weather regimes. These same mountains also effectively cut off any sea breeze cooling effects in the summer. Most of the weather in the Chunchon "basin" is of a local nature.

Runway 03-21, asphalt, 150'X4000' base operations and weather station 150 yards east of the center taxiway intersection.

Pg 7





A - 5

CAMP WALKER

A. 5. Camp Walker (H-805), Taegu

Location: 35°50'N 128°35'E (DQ630660)

Elevation: 230' OL-H, Det 18, 30WS

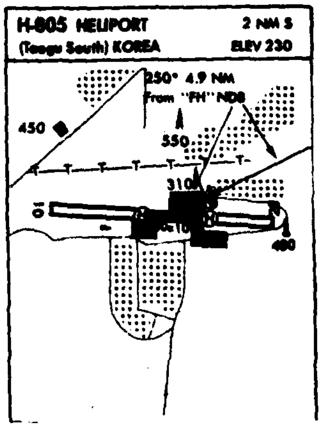
Taegu is situated in the south central portion of Kyongsang-Pukto (province). It is on the south bank of the Muho-gang, a major tributary of the Naktong-gang, the second largest river in the R.O.K., which flows southward five miles west of the city. It is 129 miles southeast of Seoul, 52 miles north-northwest of Pusan and 39 miles west-southwest of P'ohang.

Terrain, 12 miles east and 7 miles west, is flat river valley, 3 1/2 to 6 miles wide. Within 5 miles are mountains rising gradually to 2200' in the north and abruptly to 3000' in the south. Within 25 miles terrain in all directions is quite rugged with peaks to 4700'. The highest mountain on the mainland R.O.K. is Chiri-san (6,283') 52 miles southwest.

Moisture sources are widespread with river valleys to the east, north and west. The city, like all others in the R.O.K. is growing rapidly with rapid industrialization along the rivers. Many petro-chemical plants are among the new industry and are heavy polluters in the region. A new branch from the Pusan-Seoul Expressway runs along the west side of the city south to Masan, near Chinhae, on the south coast. Camp Walker and H-805 are on the southwest edge of the city proper with mixed commercial and residential areas surrounding on all sides except to the south where a 2200' E-W mountain ridge peaks at exactly 2 miles.

Runway (closed to fixed-wing aircraft) (10-28), 150'X4300', asphalt.

Base Operations and weather station on east side of ramp 300 yards north of the runway. Dust off operations south of south ramp.



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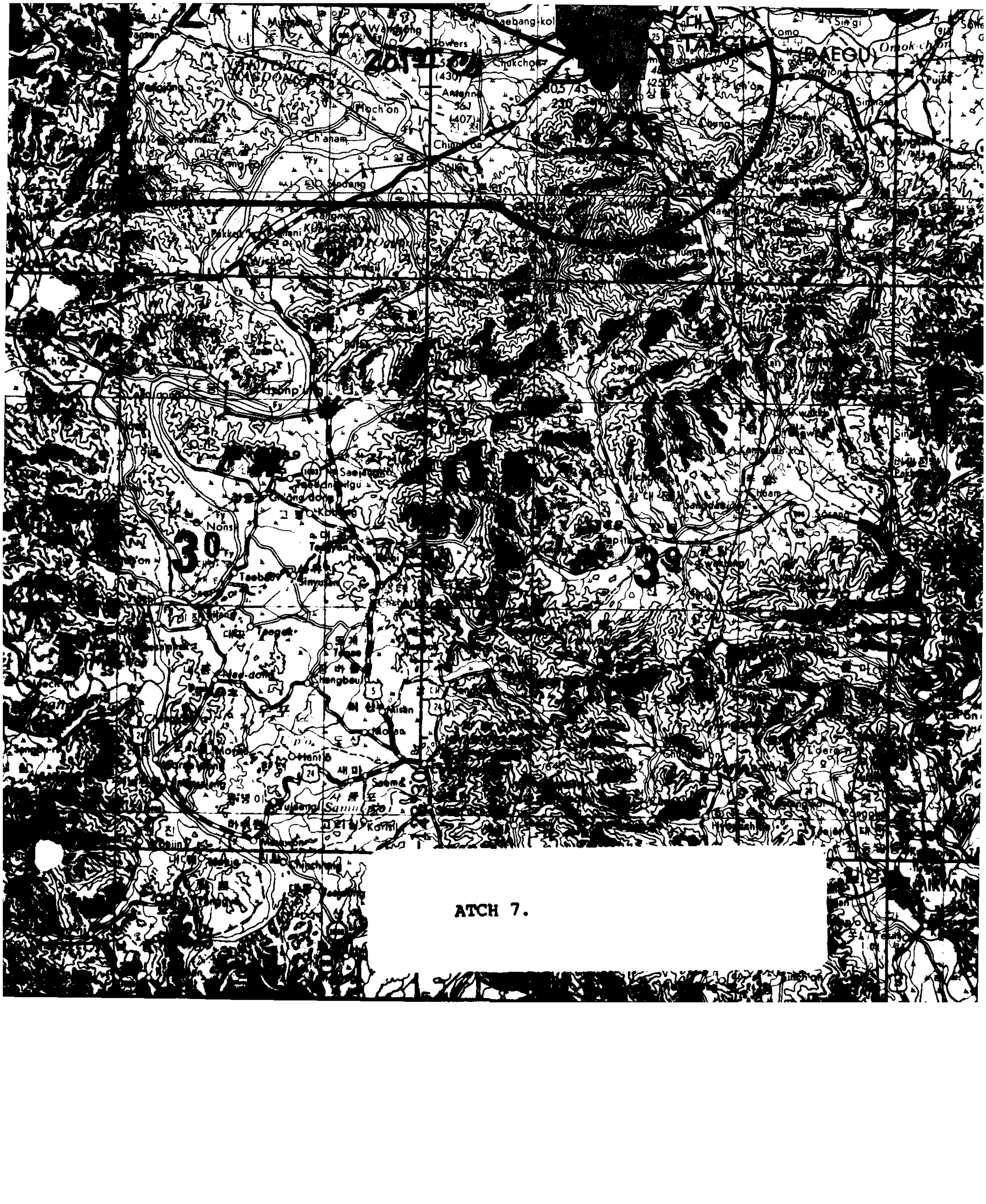


ATCH 7.

A - 6

LOCATION OF EQUIPMENT

H-201 YONGSAN (RKSY)

1. Fixed Met Equipment
   Wind Equip - GMQ-11
   Instrument Shelter - ML-17
   Rain Guage - ML-41b

2. The present location for the wind equipment is on the roof of the tower cab situated directly above the weather station, approximately 35 feet above ground level.

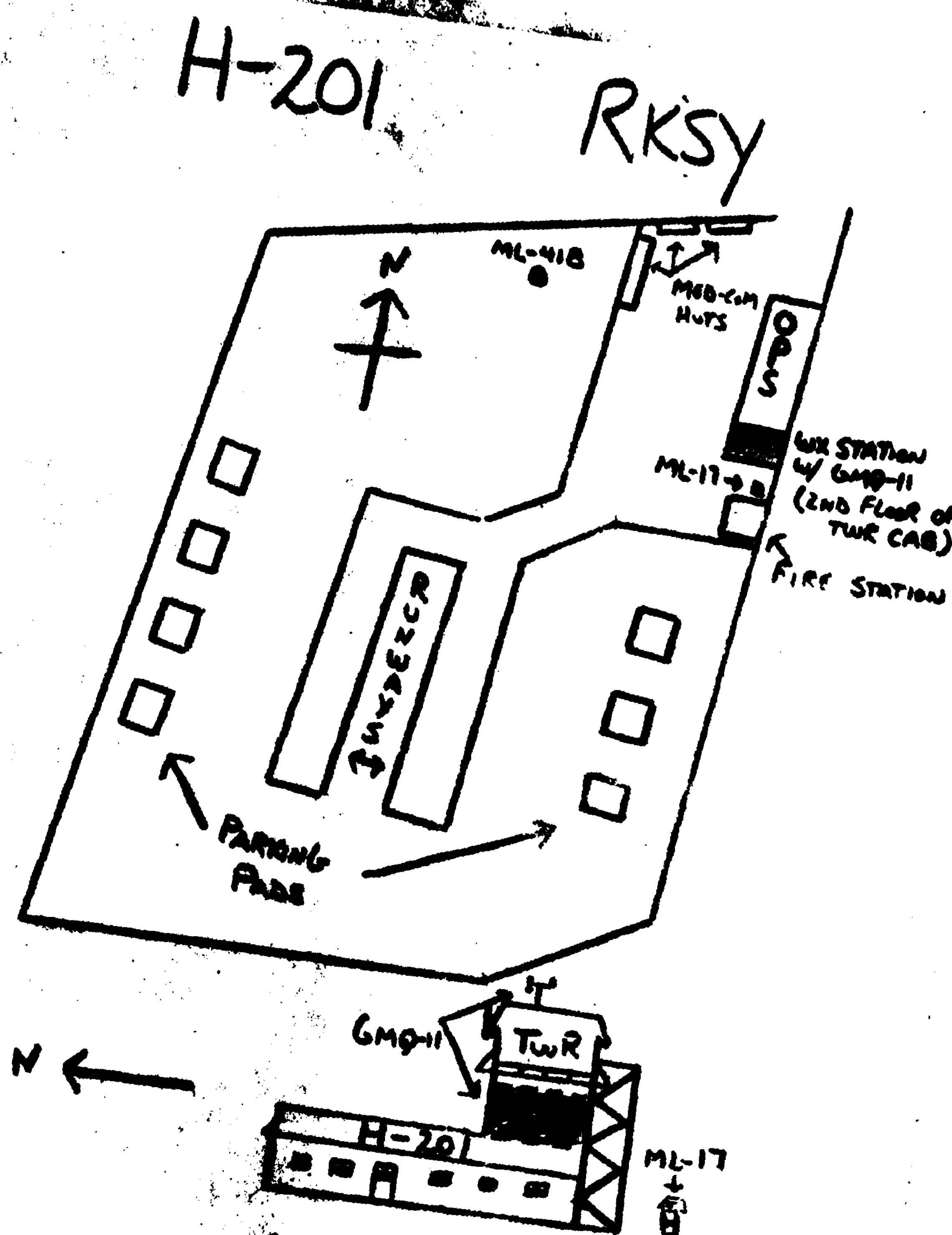
3. The following are limitations and weaknesses affecting observations taken at the present observing site:

a. Visibility is sorely restricted due to the location of the observing site. H-201 is situated admidst an area of expansive construction which limits the eastern and western quadrants to an eighth of a mile and one mile respectively. H-201 is also flanked by a hill to the north limiting that quadrant to two miles.

b. Winds, as with visibility, are also effected by the construction in the area. Winds blowing from the east are considerably lights due to these structures.

c. An unstandardized aneroid is used for pressure.

4. The major local effects encountered at H-201 concern the formation of fog and haze. With a good-sized river skirting the southern edge of the field, there is ample moisture for fog to form. Haze (closer to smog) occurs more times than not due to the great number of factories and automobiles in the area.



H-201
RKSY
N
ML-41B
MED-COM HUTS
OPS
WX STATION W/ GMQ-11 (2ND FLOOR OF TWR CAB)
ML-17
FIRE STATION
RUNWAY
PARKING PADS
GMQ-11
N
TWR
H-201
ML-17

ATCH 8.

A-306 CAMP PAGE (RKNC)

1. Fixed Met Equipment

   a. Instrument Shelter (ML-17)

   b. Rain Guage (ML-41b)

   c. Wind Equipment (GMQ-11)

2. Limitations

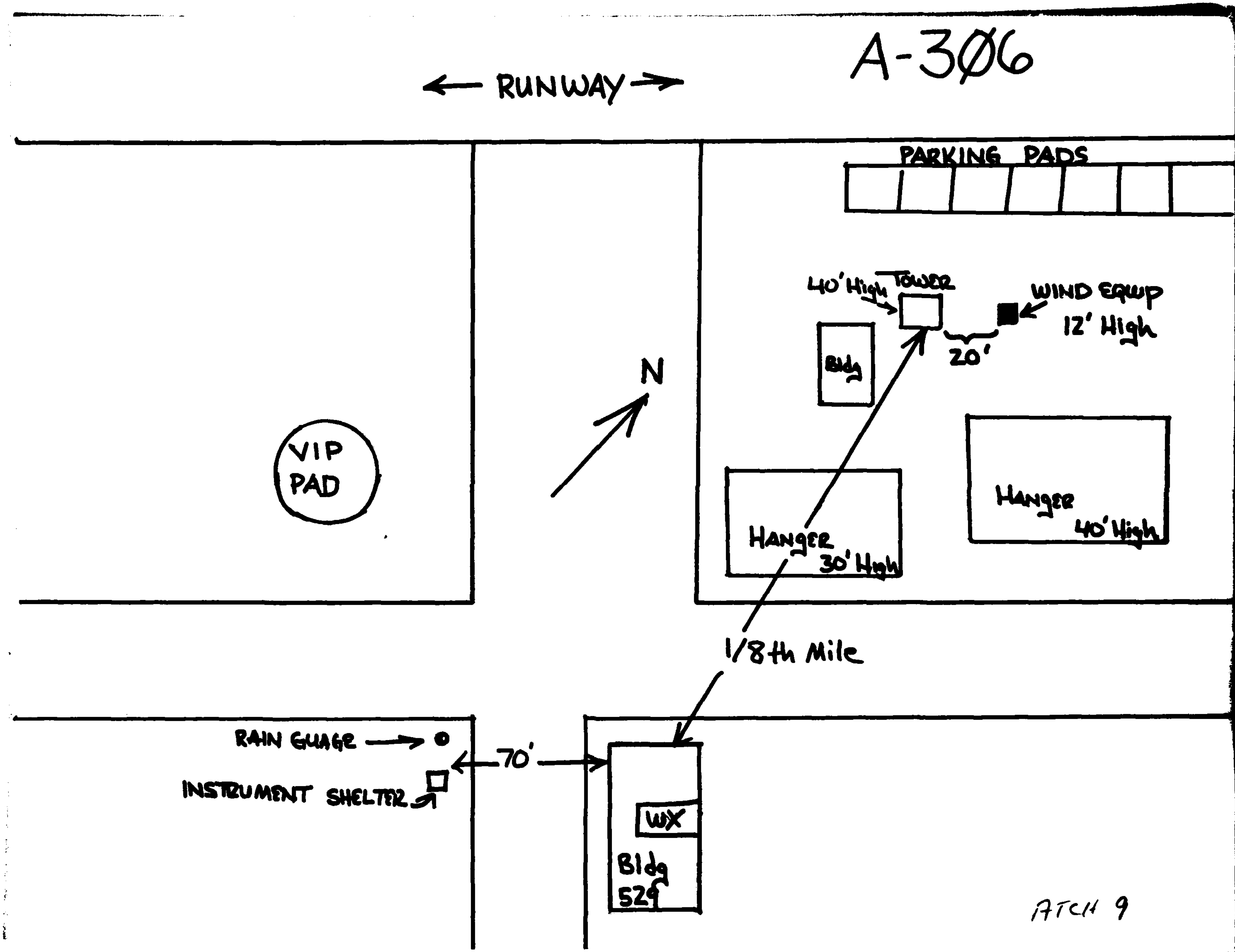
   a. ATC tower and two hangers block winds from the southeast thru south thru west-southwest.

   b. There are no night visibility markers beyond 7/8 mile.

   c. Buildings, trees, and hills limit visibility in the east thru south-southwest sector.

   d. Parking pads are within 80 feet of the wind sensors.

3. See map for location of equipment.


A-3Ø6
RUNWAY
PARKING PADS
40' High
TOWER
WIND EQUIP
12' High
20'
Bldg
N
VIP
PAD
HANGER
30' High
HANGER
40' High
1/8th Mile
RAIN GUAGE
INSTRUMENT SHELTER
70'
WX
Bldg
529

ATCH 9

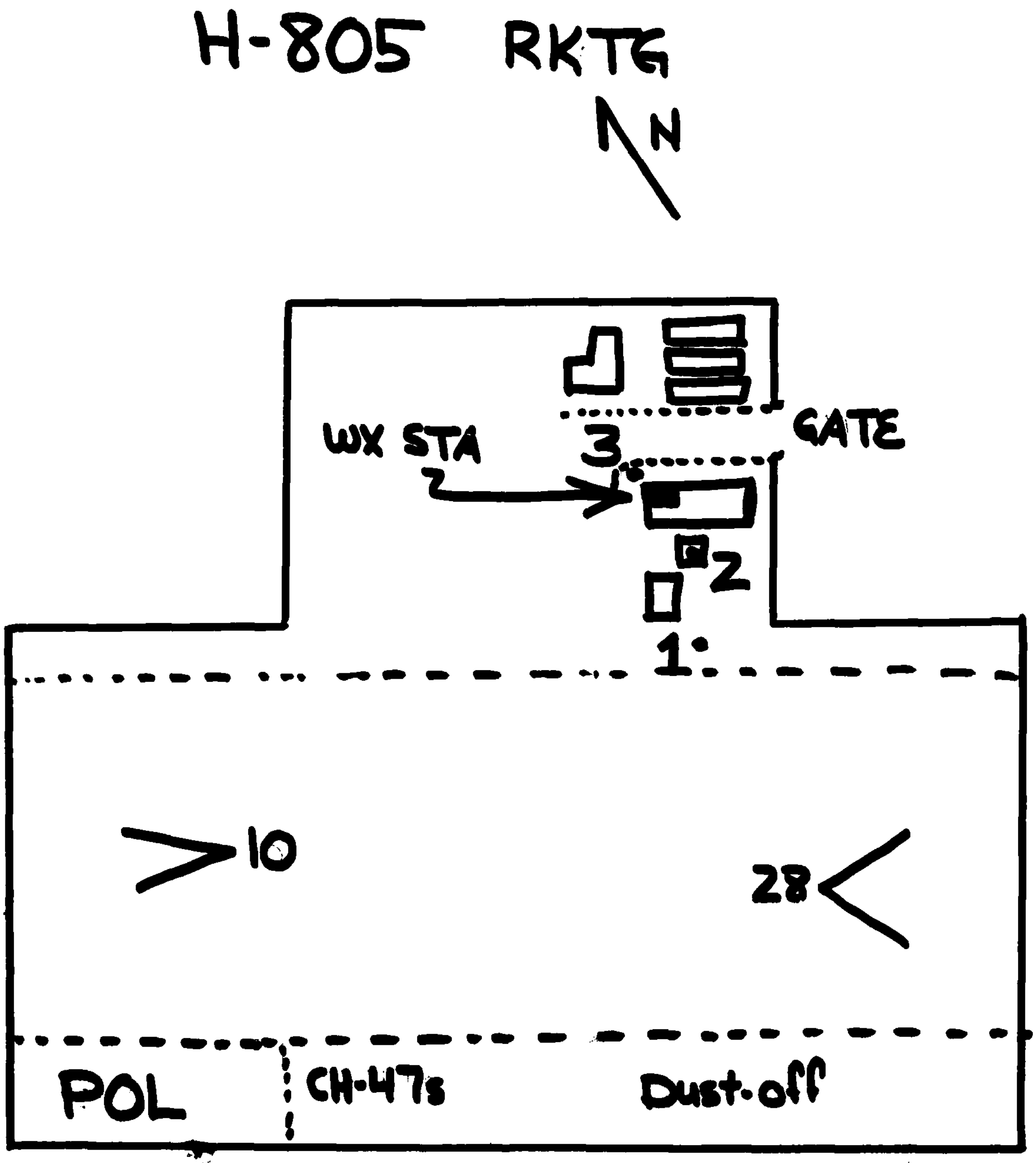
H-805 CAMP WALKER, RKTG

1. Fixed Met Equipment
   Wind Equipment - GMQ-11
   Instrument Shelter - ML-17
   Rain Guage - ML-416

2. Wind equipment located on tower approximately 35 feet above ground.

3. Limitations - Airfield surrounded by buildings to the northern one-half. Hills and mountains are on all quadrants between 1 mile to the south, 5 miles to the east and northwest.

4. The pollutants in the air from the surrounding city combined with the "trapping" effect of the mountains cause visibility problems that are slow to improve diurnally.



1. Insteument Shelter
2. Wind Equipment (on tower)
3. Rain Guage

ATCH 10.

A - 7

INDEX OF OTHER LOCATIONS

A-7 INDEX - OTHER LOCATIONS

GENERAL: Det 18 briefs Army aircraft to all parts of Korea. Some of the more frequent or important locations are described in Forecast Aid Book # 1 . An index of locations is:

a. Camp Stanley (H-207), Uijongbu
b. Suwon A.B. (K-13)
c. Kimpo (Seoul International K-16)
d. Camp Stanton (H-112), Sinsan-Ni
e. Seoul A.B. (K-16), Sinchon-Ni
f. Osan A.B. (K-55)
g. Camp Casey (H-220), Tongduchon
h. Camp Humphreys (A-511), Pyongtaek
i. Taejon A.B. (K-5)
j. Taegu A.B. (K-2)
k. Kunsan A.B. (K-8)
l. Camp LaGuardia (H-210), Uijongbu
m. Sokcho (R407)
n. Pohang (R815, K-3)
o. Yechon (K-58)
p. Hoengsong (K-46), R-401), Wonju
q. Kwangju A.B. (K-57)
r. Chinhae (R813, K-10)
s. Kangnung (K-18)
t. Paengyong-Do (K-53, P-Y-Do)
u. Cheju-Do (K-40)
v. Kojin-Ni (R413)
w. Yang-gu (R404)
x. Sachon (R814, K-4)
y. Pusan
z. Hyonli (R420)
(1) Rodriguez Range

SECTION B

WEATHER IMPACT ON SUPPORTED UNITS

SECTION B - WEATHER IMPACT ON SUPPORTED UNITS

1. Yongsan/H-201

Unit	**Weather Element	Resource	Operation	Customers Actions
HQ/UNC/CFC/USFK/EUSA	d,g	Military Forces	Control	As necessary
17th Avn Gp	g	People/Acft	Control	As necessary
52nd Avn Bn	a,b,c,e,g	UH-1H	Flying	LAFP Section A
377th Medical Co.	a,b,c,e,g	UH-1N	Medevac	LAFP Section A
125th ATC Bn	Observations	Aircraft	Control	Relay
Far East Dist Eng	g	Equipment/Acft	Construction	Plan according
AFKN Radio/TV	f	Morale	Information	Information
"Poncho" Radar	a,b,c	Aircraft	Control	Relay
FOC-S	a,b,c,d,e	Aircraft	Control	Relay

**Weather Element Table

a. Visibilities
b. Ceilings
c. Severe Turbulence
d. Hard Freeze
e. Weather Warnings issued by WSU
f. Public Service Briefing
g. Climatological or other weather information as required.

a. Weather thresholds and customer reactions are contained in the LAFP, Section A. Leadtimes are in the SOPs.

b. Customer Costs - Since the Army is in a more-or-less constant state of training rather than training towards a goal with set milestones, if is difficult to determine the cost of an aborted flight. For example, if all flying is grounded because of low visibilities or severe turbulence, members accomplish ground-type training such as required reading/testing, gear/equipment maintenance or physical fitness training. In a real sense, the day isn't lost; different training is accomplished. Hard-freezes are also too nebulous to put a dollar sign on. During a hard-freeze, options for ground operations increase for both friendly and unfriendly forces.

2. Camp Page

Unit	**Weather Element	Resource	Operation	Customer Actions
117th Avn Co.	a,b,c,e,g	UH-1H, OH-58	Flying	LAFP Sec A

NOTE: The Weather Element Table (**), and items 1a and 1b apply.

Pg 1

3. Camp Walker

Unit	**Weather Element	Resource	Operation	Customer Actions
3rd Avn Det	a,b,c,e,g	UH-1H	Flying	LAFP Sec A
19th Support Comd	g	People	Control	Information
377th Medcal Co.	a,b,c,e,g	UH-1N	Medevac	LAFP Sec A

NOTE: The Weather Element Table (**), and items 1a and 1b apply.

4. Clarifying Remarks on Customer Needs:

a. Control - Control encompasses operations, training, weapon systems, equipment, supplies and people. In other words, management of one or more vital resources. Examples of the need for weather information include the halting of flying the BZ when weather conditions make terrain markers difficult to distinguish and increased alert procedures during hard freezes.

b. Equipment and Supply - Both can be affected by temperature extremes in terms of operation and storage. Heavy rains can also be a factor.

c. Aircraft Control - ATC units, FOC-S, and Poncho are concerned with any weather element that could affect aircraft operations. For example, aircraft safety and flying into the Buffer Zone are contingent upon weather conditions.

d. Ground Weapon Systems - Rain can mire tanks etc. Rendering them virtually imobilized. Hard freezes can make normally untrafficable rice fields into excellent avenues for both friendly or unfriendly heavy armour and thereby signal need for increased surveillance.

e. AFKN Radio/TV - Covering all of Korea, the Det 18 representative provides an important mission for the activities and morale of the "Troops." During hazardous weather (Typhoons), weather releases are increased to keep everyone current.

5. Aircraft operational characteristics and significant weather thresholds are in the attachments.

ROTARY WING AIRCRAFT

	AH-1	CH-34	CH-47	CH-54	OH-6	OH-13	OH-23	OH-58	[illegible]
Normal Cruise (kts)	150	80	(1)	100	120	70	70	100	70
Endurance Without Reserve	2+90	2+30	(2)	2+00	2+25	2+30	2+10	2+10	2+[illegible]
Landing/Take Off Minimums	VFR	(4)	(4)	VFR	VFR	VFR	VFR	VFR	VFR
Maximum Gust Spread (kts)	[illegible]	15	20	20	20	10	10	20	15
Maximum Winds (kts)	[illegible]	45	(5) 30	(6) 50	(7) 40	25	30	(8) 45	[illegible]5
Maximum Cross Wind (90°) (kts)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Icing Limitations	Avoid	Avoid	Avoid	Avoid	Avoid	Avoid	Avoid	Avoid	Avoid
Turbulence Limitations	MOD	MOD	MOD	MOD	Lt	Lt	Lt	Lt	Lt

Normal cruise speed vary: CH-47 A & B 130 kts CH-47C 170 kts.

Endurance for CH-47 A & B 1+30 CH-47C 2+30

Endurance varies between models and aircraft configuration. Normal endurance UH-1B & C 1+30 [illegible] B 2.[illegible]

Determined by pilots instrument qualification and approach minimums.

Limited by shut down.

Winds 45 kts and above must be head on for starting and shut down.

Limited by start; maximum 30 kts wind for sideward and rearward flight.

Limited by starting and stopping.

ATCH 1

FIXED WING AIRCRAFT

	O-1	OV-1	T-41	T-42	U-1	U-6	U-8	U-21	C-5	C
Normal Cruise (kts)	(1)	185	115	180	105	105	155	190	[illegible]	L
Endurance without Reserve	(2)	1+45	3+30	4+00	6+00	5+30	3+30	4+30	[illegible]	5+
Landing/Takeoff Minimums	(3)	(4)	VFR	(4)	(4)	(4)	(4)	(4)	500-1	(
Maximum Gust Spread (kts)	10	20	10	15	10	15	15	(5)	N/A	
Maximum Cross Winds (90°)	8	13	15	15	13	10	20	21	30	
Maximum Winds (kts)	25	60	30	40	30	35	40	60	/	
Icing Limitations	Avoid	Mod	Avoid	Mod	Avoid	Avoid	Mod	Mod	Mod	
Turbulence Limitations	Mod	Mod	Mod	Mod	Lt.	Mod	Mod	Mod	Mod	

(1) Normal cruise O-1A thru D 87 kts O-1F 120 kts.

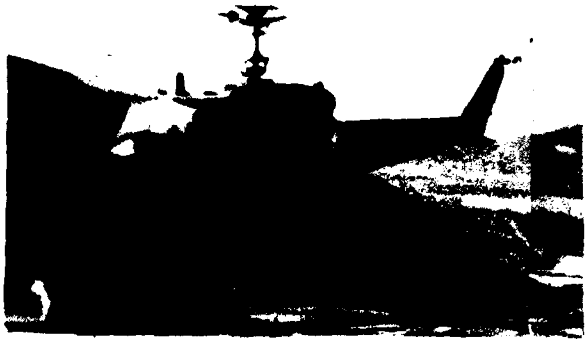
(2) Endurance for O-1A thru D 4+15 O-1F 3+00.

(3) O-1A not equipped for IFR flying others determined by pilot instrument qualification and approach minimums.

(4) Determined by pilots instrument qualification and approach minimums.

(5) Not published.

(6) Maximum cross wind (90°) conventional gear 19 kts tricycle gear 25 kts.



[redacted]

BELL
IROQUOIS UH1H

True airspeed and altitude (normal cruise):

a. 90 knots.

b. 500 feet AGL.

Landing and takeoff minimums:

200 feet/½ mile.

Maximum cross-wind for takeoff/landing:

a. Difficulty in controllability while hovering can be expected with 30 knot cross-winds.

Limitation of operation in icing or turbulence:

a. Equipped with anti-icing and de-icing. Restricted from flight other than a trace of icing.

b. Restricted from flight through moderate or greater turbulence.

Airborne severe weather avoidance capability:

None.

Critical takeoff elements:

Pressure altitude and temperature.

Average flight time without refueling:

3+00 hours.

Unique problems:

Continuous flight in trace icing is not recommended.
Max gust spread for takeoff=15kts.

BELL
HUEYCOBRA AH-1

True airspeed and altitude (normal cruise):
a. 150 knots.
b. 200 - 3,000 feet.

Landing and takeoff minimums:
VFR only.

Maximum cross-wind for takeoff/landing:
a. NA
b. NA

Limitation of operation in icing or turbulence:
a. Avoids all icing conditions. No de-icing equipment.
b. Can fly in moderate turbulence.

Airborne severe weather avoidance capability:
None.

Critical takeoff elements:
Needs density altitude.

Average flight time without refueling:
2+00 hours without reserve.

Unique problems:
None.

BELL
KIOWA OH-58

True airspeed and altitude (normal cruise):

a. 100 knots.
b. 200 - 3,000 feet.

Landing and takeoff minimums:

VFR only.

Maximum cross-wind for takeoff/landing:

a. No cross-wind limitation.
b. 45 knot head-wind limitation.

Limitation of operation in icing or turbulence:

a. Avoids all icing.
b. Can fly in light turbulence only.

Airborne severe weather avoidance capability:

None.

Critical takeoff elements:

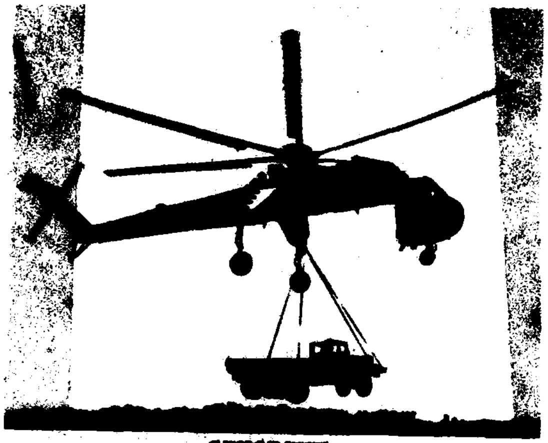
Winds.

Average flight time without refueling:

2+40 hours without reserve.

Unique problems:

Maximum gust spread for takeoff = 20 knots.



SIKORSKY
TARHE CH-54

True airspeed and altitude (normal cruise):
a. 100 knots.
b. 500 - 5,000 feet.

Landing and takeoff minimums:
VFR only.

Maximum cross-wind for takeoff/landing:
a. No cross-wind limitations.
b. Limited to 50 knot head-winds.

Limitation of operation in icing or turbulence:
a. Avoids all icing. No de-icing equipment.
b. Can fly in moderate turbulence.

Airborne severe weather avoidance capability:
None.

Critical takeoff elements:
Maximum wind speed; wind gust spread.

Average flight time without refueling:
2+00 hours without reserve.

Unique problems:
Maximum gust spread for takeoff=20 knots.

VERTOL
CHINOOK CH-47

True airspeed and altitude (normal cruise):
a. A and B models = 130 knots; C model = 170 knots.
b. 500 - 5,000 feet.

Landing and takeoff minimums:
Limited to approach minimums and pilot qualifications.

Maximum cross-wind for takeoff/landing:
a. No cross-wind limitation.
b. 30 knot head-wind.

Limitation of operation in icing or turbulence:
a. Avoids all icing. No de-icing equipment.
b. Can fly in moderate turbulence.

Airborne severe weather avoidance capability:
None.

Critical takeoff elements:
Limited to 30 knot head-wind.

Average flight time without refueling:
A and B models = 1+30 without reserve; C model = 2+30 without reserve.

Unique problems:
Maximum gust spread = 20 knots.

GRUMMAN
OV-1 MOHAWK

True airspeed and altitude (normal cruise):
- a. 185 knots.
- b. 2,000 - 10,000 feet.

Landing and takeoff minimums:
Limited to approach minimums and pilot qualifications.

Maximum cross-wind for takeoff/landing:
- a. 18 knot cross-wind.
- b. 60 knot head-wind.

Limitation of operation in icing or turbulence:
- a. Icing up to and including moderate can be handled.
- b. Turbulence up to and including moderate can be handled.

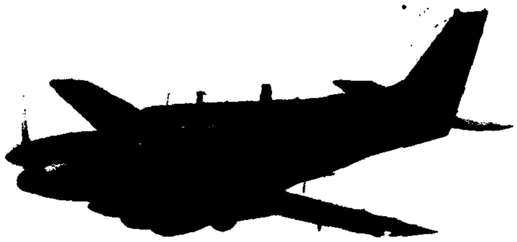
Airborne severe weather avoidance capability:
None.

Critical takeoff elements:
Cross-winds.

Average flight time without refueling:
1445 hours without reserve.

Unique problems:
Maximum gust spread for takeoff = 20 knots.

ARMY AIRCRAFT FLOWN IN KOREA



BEECH
UTE U21A

BEECH
UTE U21F

True airspeed and altitude (normal cruise):
- a. 190 knots.
- b. 2,000 - 10,000 feet. (occasionally 10M-22M)

Landing and takeoff minimums:
Limited to approach minimums and pilot qualifications.

Maximum cross-wind for takeoff/landing:
- a. 21 knot cross-wind.
- b. 60 knot head-wind.

Limitation of operation in icing or turbulence:
- a. Capable of flying in moderate icing.
- b. Capable of flying in moderate turbulence.

Airborne severe weather avoidance capability:
None.

Critical takeoff elements:
Cross-winds.

Average flight time without refueling:
4+30 hours without reserve.

Unique problems:
None.

SECTION C

SYNOPTIC CLIMATOLOGY

GENERAL SYNOPTIC CLIMATOLOGY

1. Climatic Controls: The climate of Korea is controlled by its peninsular nature and by its location between the world's largest land mass and largest body of water. On the east side of Korea the relatively cool deep waters of the East Sea greatly modify any air mass that might affect the area from the east while on the west the relatively warm waters of the Yellow Sea attract and provide a source of energy for cyclones. All water bodies serve to provide adequate moisture for convective activity or low-level cloudiness.

a. The lifting effect of the north-south mountain ranges makes windward locations conducive to fog, low-level cloudiness and precipitation while leeside areas experience fairer weather. The effects of the mountains and the water bodies are evident in the variety of weather conditions that can exist over a relatively small area.

b. For climatic purpose, the ROK can be divided into four zones: (1) The east coast - a narrow strip of low land east of the mountains extending almost the entire length of the peninsula; (2) the south coast; (3) the west coast and slopes; and (4) the mountainous areas themselves.

c. The climate of Korea is monsoonal in nature. The beginning and ending of the four seasons vary slightly, but the winter season (monsoon) normally starts about the first of November and terminates in late March. The summer monsoon includes June, July, and August. Spring and autumn are transitional periods.

2. Seasons:

a. Winter: The prevailing flow of air varies between northwest and north-northeast. The intense Asiatic anticyclone is centered over Northern China or Siberia. As a result, Korea is dominated by a cold outflow of polar continental air from Siberia and occasional outbreaks of polar maritime air from the Sea of Okhotsk. The continental air mass is very dry and the weather is generally cloudless, dusty, and cold. Where the air mass has traveled over relatively warm seas and picked up sufficient moisture, showers of snow, sleet, or rain occur especially in southwest.

(1) The airflow and the associated weather are modified by the high terrain characteristic of the area. Often a small lee depression persists in the gulf near Wonsan (055), and because of this eddy, the wind just south of Wonsan is generally southwesterly. Because similar troughs or depressions occur on the lee side of almost all of the terrain barriers, the pressure and wind patterns are often very confusing.

(2) Lulls in the persistent northerly monsoon flow are caused by periodic passages of migratory highs, lows and fronts.

b. Spring (Intermonsoon): Usually by late March or early April, the Siberian high begins receding toward the northwest, and the direction of the wind flow over Korea becomes variable. There is an increase in the amount of cloudiness and the frequency of poor visibilities. The over-lying air mass is primarily continental polar and is still relatively cold, but may be moist or dry depending upon its trajectory. Cold anticyclones usually move southeastward across Manchuria and North China between each major cyclonic depression. Toward the end of spring the anticyclones become weaker.

c. Summer (Monsoon): The Pacific high is at its peak strength and dominates the circulation over Korea. This circulation pulls maritime tropical air over the ROK from the subtropical Pacific. The interactions between this air mass and the continental polar air mass cause frequent and heavy rains. Summer is also the season for typhoon activity.

d. Autumn (Intermonsoon): Autumn is a very brief transitional period between the summer and winter monsoons. Like spring, there is no definite windflow pattern. Early in the season the cold fronts forming over Manchuria begin to advance farther south, causing stronger and more frequent outbreaks of continental polar air. At first, the weather is relatively warm and pleasant but by mid-October, frost occurs over the northern part of the nation, and cold spells become more frequent. There are brief wet periods from frontal passages, and typhoons occasionally interact with the polar boundry to bring rain to the south.

3. Precipitation: Rainfall in Korea is subject to large seasonal and local variations. The mean annual amount of precipitation varies from less than 30 inches in the northeastern part to between 50 and 60 inches in the central and extreme southern parts. The mountainous sections record relatively large amounts.

a. Winter: Winter is characterized by light precipitation with less than an inch per month in much of the northern interior. Over most of the coastal regions, monthly precipitation amounts average 1 to 2 inches. Of the annual amount, only 5% to 10% of the total precipitation occurs in winter. The frequency of winter precipitation depends, to a large extent, upon the location of the reporting station with respect to the prevailing winds and mountain ranges. Station on the windward side of the mountains report 8 to 12 days with precipitation, while those in the lee of higher mountain ranges report 4 to 8 days. Almost all precipitation is in the form of snow except in the south.

b. Spring: The light precipitation of winter continues until the beginning of April, when a steady increase in amount and frequency is noted. During April and May, an average amount of 2 to 4 inches per month is normal.

c. Summer: June through August is the period when the frequency of precipitation is greatest, occurring an average of 12 to 16 days per month in most areas. During June, 4 to 6 inches are normal except along

the south coast where 8 to 10 inches are recorded. July is the month of maximum rainfall. Eight to 12 inches are normal for most areas with 16 inches being recorded in the mountains of central Korea.

d. Autumn: The precipitation amounts begin to taper off from the normal summer maximum. From 5 to 6 inches in September to 1 to 2 inches in October are recorded for most areas. The south coast typically gets 1 to 2 inches more than the rest of the country.

e. Precipitation extreme: Extremes are important in operational planning. In summer, monthly amounts of 18 to 25 inches have been quite general in the central and southern portions of the peninsula. Heavy rains occur when fronts become quasi-stationary over Korea or when a typhoon passes near. Maximum amounts of 6 to 9 inches during a 24 hour period have been recorded. The outstanding feature of Korean rainfall, insofar as ground operations are concerned, is the exceedingly heavy downpours of July and August which may deluge the land. When these rains are accompanied by winds, they may cause great damage, washing out irrigation ditches, roads, and even villages.

f. Thunderstorms: Activity is mostly confined to the warm months. June is the month of maximum occurrence. Thunderstorms are more frequent over the western sections (2 to 3 days per month) than along the east coastal regions (1 to 2 days per month).

4. Temperature and Humidity:

a. Winter - With the exception of the southernmost fringes, all of Korea has a high frequency of days with sub-freezing temperatures. The daily maximum and minimum temperatures vary considerably throughout the peninsula. For example, Pusan has a January mean daily maximum of 44°F while Yongsan has a mean of 32°F. The January mean daily minimum temperature is 29°F at Pusan and 16°F at Yongsan. Relative humidities are moderate in most sections. Mean values vary from 50% for stations along the eastern coast, where the winds are downslope and prevailingly offshore, to 70% along the southwestern coast where there is a high frequency of onshore winds.

b. Summer - Korean summers are consistently hot, without unusual extremes. During the hottest month, August, the mean daily maximum temperature varies from the middle 70's in the northern interior to the high 80's along the south coast. The extreme maximum temperatures are in the vicinity of 100°F throughout the country, being slightly greater in the northern interior (102°) and slightly less (about 95° to 98°F) in those regions where the winds are persistently onshore. Relative humidity is consistently high with mean values varying from 70% to about 90%. The lower values apply to the interior regions and the higher ones to the exposed coastal areas. During the early morning hours, relative humidity is highest. High humidities combined with high temperatures have a demoralizing effect on personnel.

5. Cloudiness and Ceilings:

a. Winter - Except in the extreme southwestern portion of the peninsula, winter is essentially a period of clear or occasionally broken skies. Throughout the peninsula, more than half of the days have a mean cloud cover of 30% to 45%. A marked exception to these figures is southwestern Korea. In this region, persistent cloudiness is experienced because the full monsoon reaches the area after a long trajectory over the Yellow Sea and arrives with stratocumulus. The most frequent type of cloud in winter is stratocumulus with ceilings ranging from 2,500 to 4,000 feet. The cloud layer is seldom very thick and the tops are about 6,000 to 8,000 feet.

b. Summer - There is more variation in ceiling heights during the summer than during the winter. In summer, stratus clouds are the most frequent type along with nimbostratus. In most sections, cloud cover averages from 65% to 75%, with one-half to two-thirds of all summer days having a mean of 80% or more cloud cover. The ceiling heights of stratus clouds range from a few hundred feet to 3,000 or 4,000 feet. The lowest ceilings occur under conditions favorable for the formation of fog - a stable atmosphere and a slow drift northward of warm moist air across cooler water. Stratus clouds generally do not penetrate far inland.

c. Diurnal - Throughout all seasons, cloud cover at Seoul and Taegu reaches a minimum during the night. The cloudiest times of the day are the early morning and late afternoon. With the exception of winter, total cloud cover usually decreases rapidly after 2000LST.

6. Visibility:

a. Visibility is at its maximum during winter because of the "cleaning-out" effect of the frequent cold surges. Occasionally visibility is reduced by dust carried aloft by strong winds from the desert regions of Mongolia and Northern China during late winter and spring. Dust aloft is most frequently observed when an inactive cold front follows a period of dry weather. The principle cause of restricted visibility is the smoke from nearby heavily populated sections and industrial sources.

b. There are two types of fog which may seriously restrict summer visibility and hamper air-ground operations. The most important of these is sea fog which forms when warm, moist air of tropical or subtropical origin passes over relatively cool waters. Sea fog is most prevalent from late March to August and affects coastal stations exposed to the southerly flow. The second type is radiation fog which can occur anywhere in the nation. Radiational fog normally persists longer in the mountainous regions where it frequently restricts flying operations till late morning and sometimes till early afternoon.

WEATHER IN THE FAR EAST

20th Weather Squadron
1st Weather Wing

Reprinted November 1969

Pg5

FOREWORD

This section draws heavily on the very fine paper by William H. Best, "A Descriptive Climatological Study of Eastern Asia and the Northwest Pacific Area" which was published in the 2143rd Air Weather Wing Technical Bulletin, Volume 1, No. 4, December 1949. Most forecasters who are assigned at a Far East station for the first time find this material of considerable value and interest.

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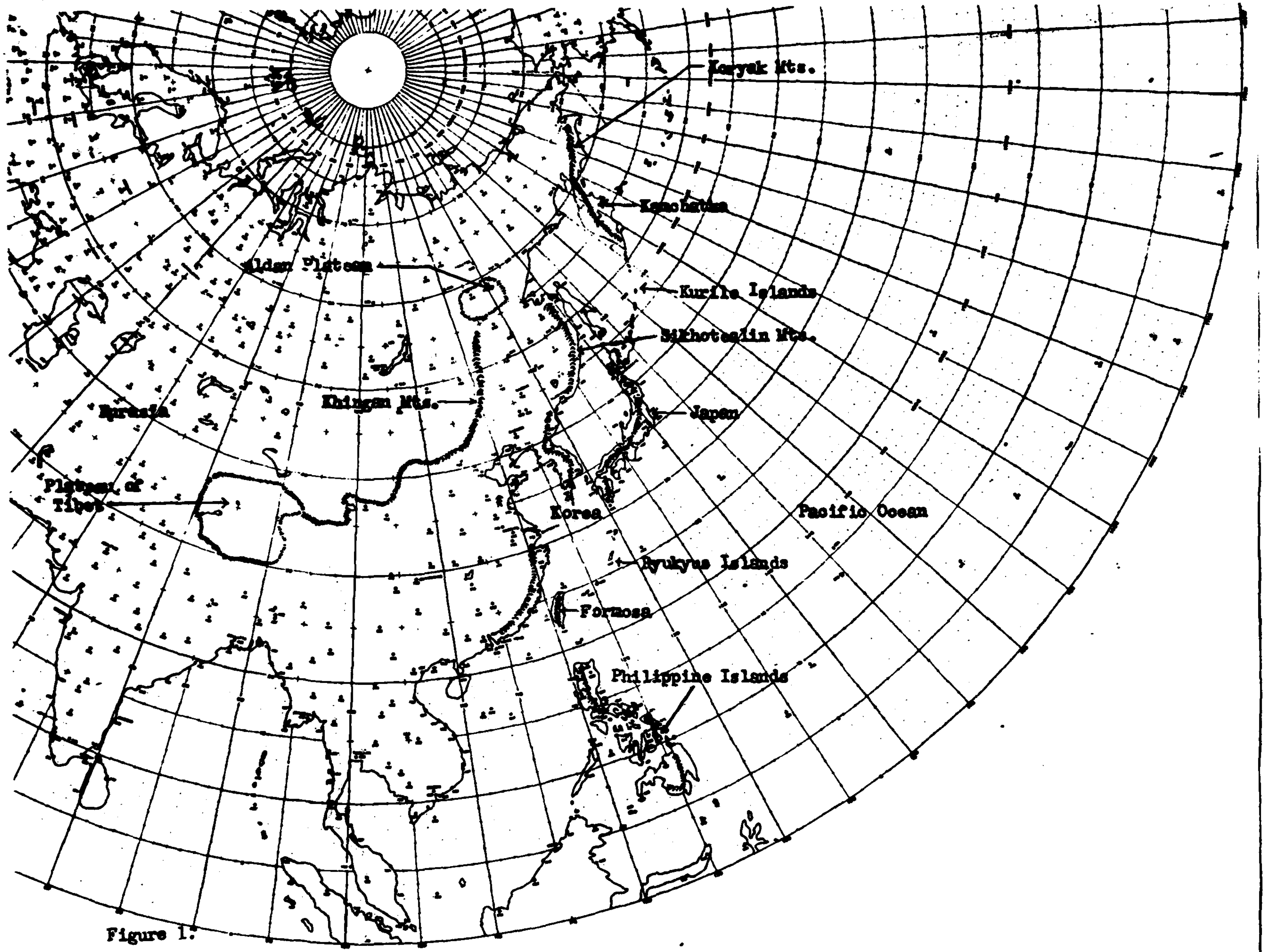

Koryak Mts.
Kamchatka
Aldan Plateau
Kurile Islands
Sikhote-alin Mts.
Khingan Mts.
Japan
Eurasia
Plateau of Tibet
Korea
Pacific Ocean
Ryukyus Islands
Formosa
Philippine Islands

Figure 1.

Weather in the Far East

1. TERRAIN AS A CLIMATIC CONTROL OF THE EAST ASIA - NORTHWEST PACIFIC FORECAST AREA (See Figure 1)

a. Gross Thermodynamic Effects:

(1) The forecast area lies athwart the border separating the earth's largest land mass, Eurasia, from its greatest ocean, the Pacific. The thermal contrast between the two surfaces is tremendous. In winter, the former behaves as a giant refrigerator, chilling and rendering extremely dense the overlying air. In summer it reverses its role and acts as a huge terrestrial hot plate. We have, in a very over-simplified sense, a great convection mechanism which reverses its sense of circulation from winter to summer. In winter, the frigid, dry continental air moving south and east away from the great central Asian anticyclone encounters air warmed and moistened during its passage for thousands of miles over the tropical Pacific. The front between these air masses is the breeding ground for intense cyclonic storms. As summer advances and a deficit of air mass develops over the interior of Asia, tropical maritime air invades the continent, the front is pushed far to the north, and the entire forecast region is exposed to attack by typhoons and tropical disturbances of lesser intensity.

(2) The character of traveling disturbances in the westerlies is usually altered very greatly as they move off the continent in winter due to the very rapid acquisition of heat and moisture from below and extrapolative forecasting techniques are especially weak for this reason. The genesis of new storms is a frequent complicating factor.

b. Mechanical Consequences of the Terrain:

(1) Mountain chains strongly affect the weather of this area. Three major chains exist. One of these begins with the Koryak mountain range in the Kamchatka peninsula and extends through the Kurile Islands, Japan, the Ryukyus Islands, Formosa, and thence to the Philippines. A second chain begins with the Sikhotealin range along the southeastern Siberian coast and extends through Korea and along the southeast coast of China. The third chain begins at the western edge of the Aldan Plateau in Siberia and joins the Khingan Mountain ranges extending southward in China and southwestward to Tibet.

(2) In winter, "cold continental" air outbreaks move southeastward in a perpendicular path over these mountain chains while in the summer half year, a flow to the northwest prevails. Air masses, frontal systems, and upper air features are considerably altered by passing over these terrain barriers. Shallow air outbreaks move erratically, while deep systems move more smoothly. Surface fronts may move aloft in passing over major peaks and then often become indistinct. Segments of fronts

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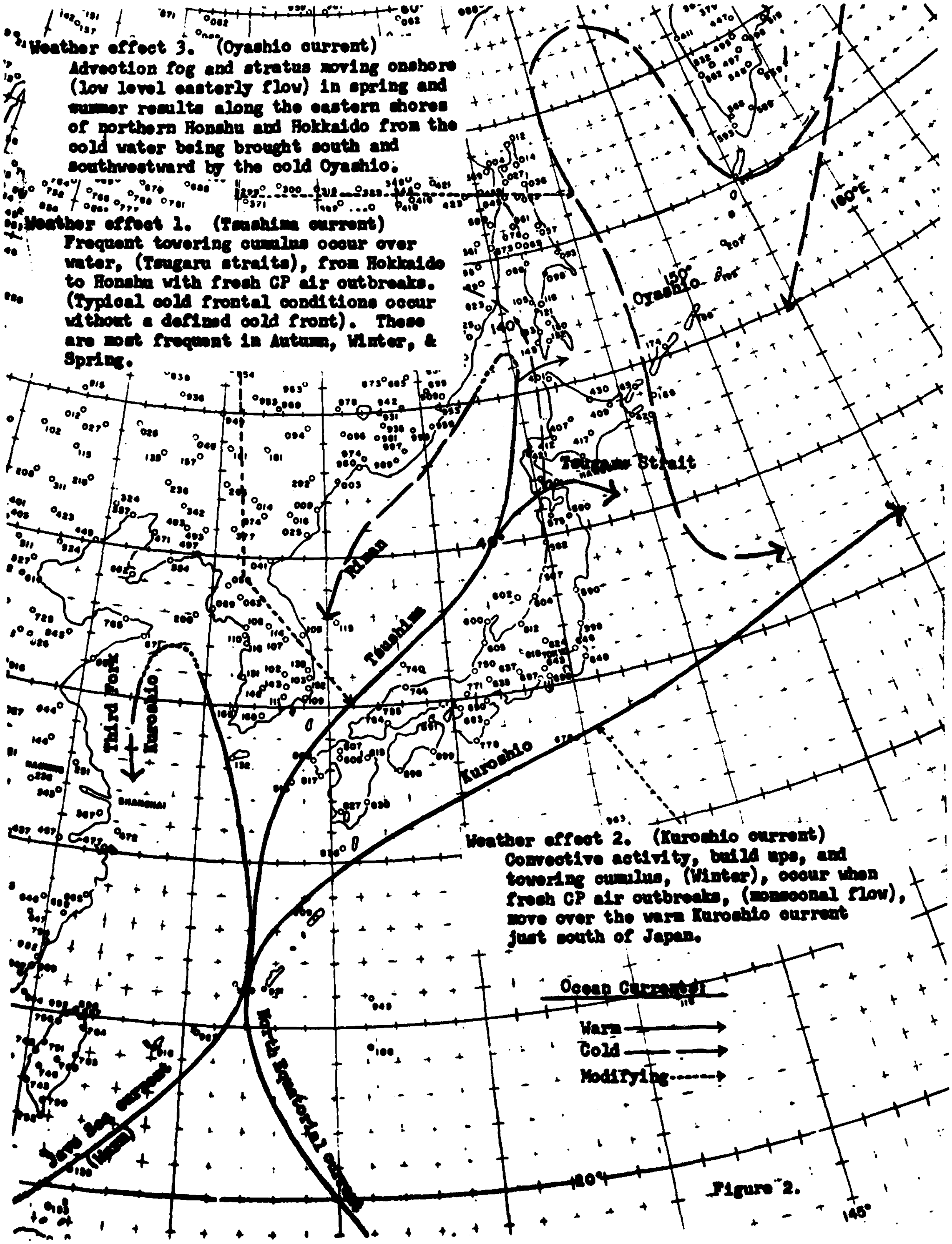
Weather effect 3. (Oyashio current)
Advection fog and stratus moving onshore (low level easterly flow) in spring and summer results along the eastern shores of northern Honshu and Hokkaido from the cold water being brought south and southwestward by the cold Oyashio.
Weather effect 1. (Tsushima current)
Frequent towering cumulus occur over water, (Tsugaru straits), from Hokkaido to Honshu with fresh CP air outbreaks. (Typical cold frontal conditions occur without a defined cold front). These are most frequent in Autumn, Winter, & Spring.
Weather effect 2. (Kuroshio current)
Convective activity, build ups, and towering cumulus, (Winter), occur when fresh CP air outbreaks, (monsoonal flow), move over the warm Kuroshio current just south of Japan.
Oyashio
Tsugaru Strait
Liman
Tsushima
Kuroshio
Third Fork
Kuroshio
North Equatorial current
150°
140°
160°E
20°
145°
Ocean Currents:
Warm
Cold
Modifying

Figure 2.

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are often slowed down or completely blocked by terrain barriers. The veering of the low level winds which normally accompany frontal passages may be retarded for several hours at stations in valleys of northeast to southwest orientation. This effect can be misinterpreted as indicating frontal deceleration or wave development.

(3) In the Japanese islands, crests along the mountain "backbone" attain elevations of 6000' (a few even higher) in Hokkaido, 7000' in Honshu, 5000' in Shikoku, and 6000' in Kyushu. These mountain chains constitute an effective climatic divide in Japan. The Japanese divide shields the Pacific side to a major degree from weather systems in the Sea of Japan, and the western coast of Japan from Pacific disturbances. The eastern mountain ranges of Korea exert a comparable effect in that area.

2. a. Pacific Ocean Surface Flow and Ocean Currents:

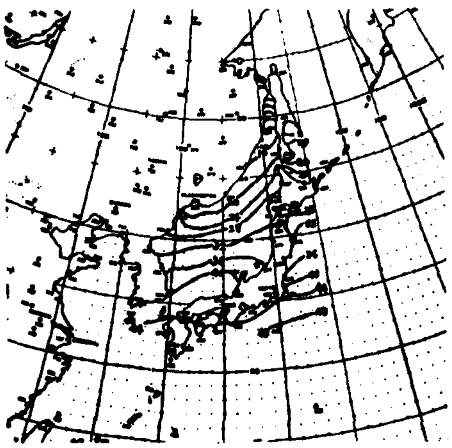
The complex system of ocean currents affecting northwestern Pacific weather is shown in Figure 2. Notice that the north equatorial current flows westward, (low latitude), and recurves northward northeast of the Philippines where it joins the main current from the Java Sea. Further north, in the East China Sea and Ryukyus Islands, this reinforced current splits into three forks. The main one, the Kuroshio, flows northeastward south of Japan to the North Pacific and then eastward to the United States after merging with the Oyashio. The second fork, the Tsushima current, flows through the Tsushima Straits, (between Korea and Japan), then northeastward to the northwest coast of Japan. This current breaks down further producing a branch which flows through the Tsugaru Straits separating Hokkaido and Honshu. The main Tsushima current continues northward off Hokkaido's west coast and into the Riman Gulf between Sakhalin Island and the mainland. A secondary branch is formed which flows through the Soya Straits between Sakhalin and Hokkaido and becomes modified afterward in the North Pacific. The Tsushima current undergoes major modification due to its loss of heat in the shallow waters of the Riman Gulf and flows southwestward along the southeastern Siberian coast and Korea as the Riman current. The third fork of the reinforced warm current flows from the East China Sea to the Yellow Sea along the west coast of Korea where it cools, (markedly in winter under the influence of the cold monsoonal air), and returns southward along the northeast coast of China.

The main cold current, the Oyashio, flows from the Bering and Okhotsk Seas, (See Figure 2), southward along the northeast coast of Japan. Further south, between Tokyo and the Bay of Sendai, it recurves eastward to merge with the Kuroshio.

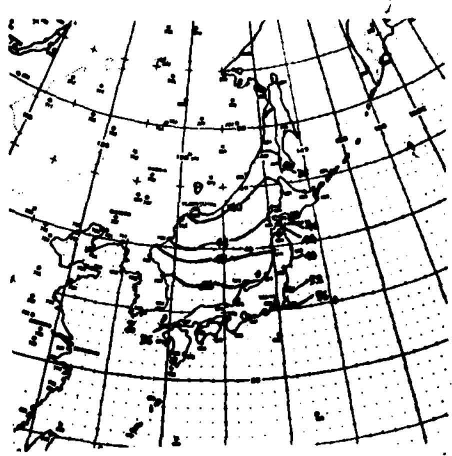
b. Sea Surface Isotherms:

Sea surface isotherms can be used to help identify air masses and determine to a considerable extent what modifications they are undergoing. Figure 3 is included to show sea surface isotherm distributions for the months of January, April, July, and September. These type charts are useful for forecasting where stratocumulus and cumulus cloud decks are likely

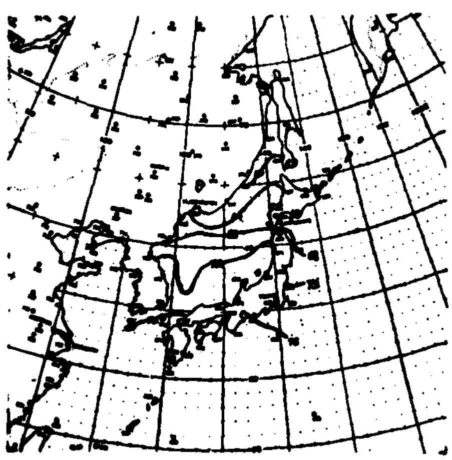
to form over the adjacent water areas of Japan and southeastern Asia. They are also reliable references for: 1. Forecasting probable areas of advection fog in late spring, summer, and early autumn at stations of northeastern Japan, and 2. Differentiating between probable areas where radiation type fog will form along the southern and northwestern coasts of Japan and where advection fog will form along stretches of the northeast coast.



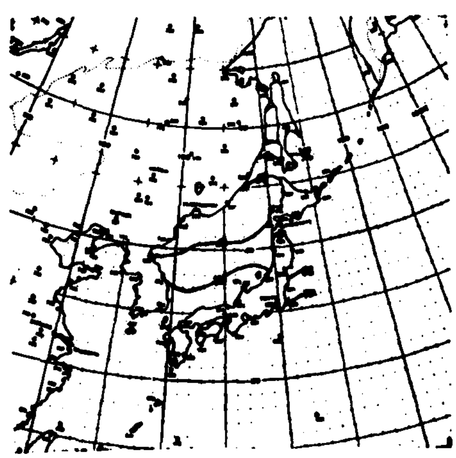
January
Sea Surface Temperatures (°F)



April
Sea Surface Temperatures (°F)



July
Sea Surface Temperatures (°F)



September
Sea Surface Temperatures (°F)

Figure 3

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3. LARGE SCALE CIRCULATION FEATURES

Inferences from the distribution of air pressure provide the best available picture of the general circulation of the Northwest Pacific area. The mean monthly surface pressure patterns for January, April, May, July, September and October are shown in Figures 4 through 9.

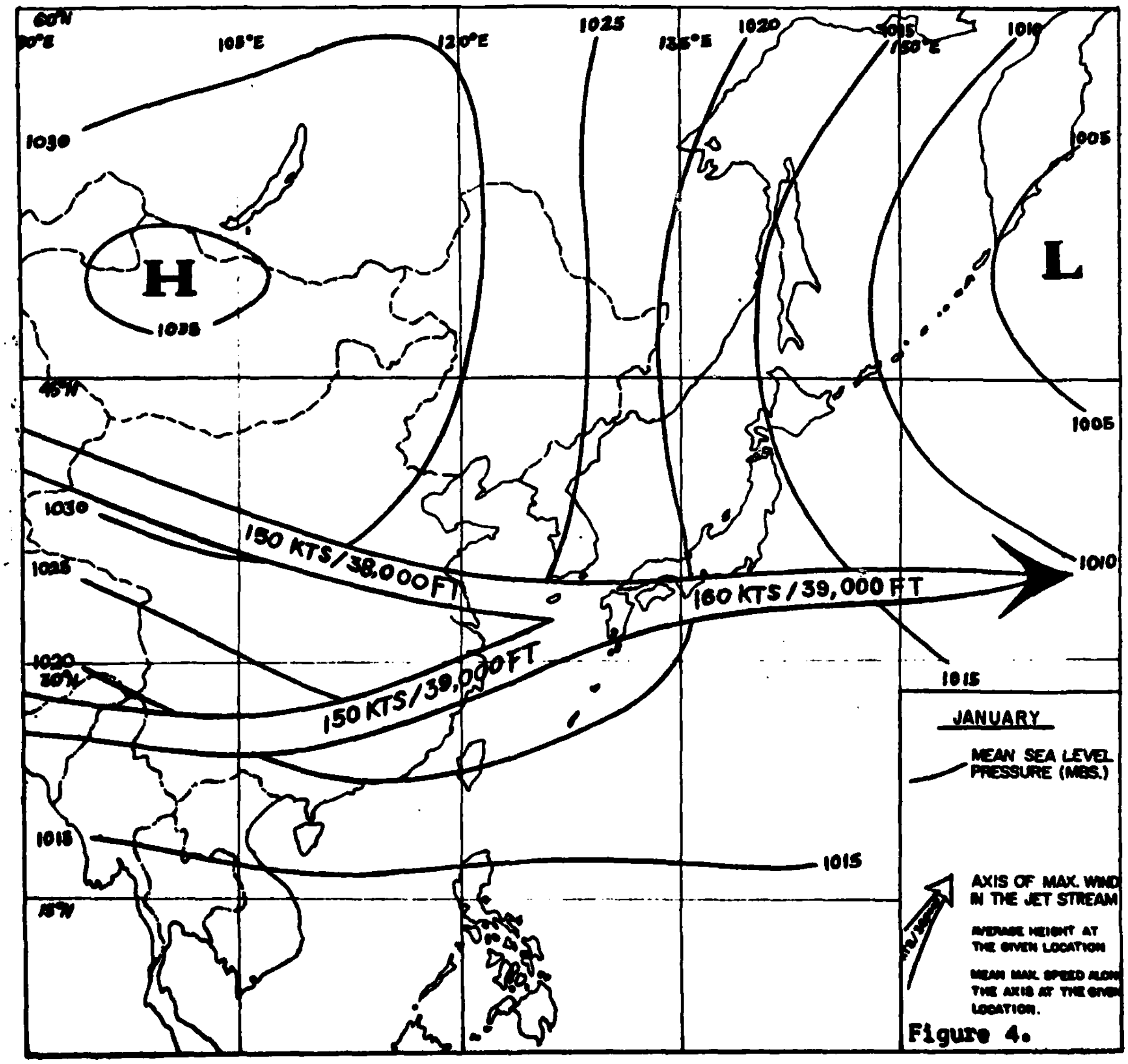

Figure 4.

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The predominant anticyclonic character of the low-level flow over Asia in winter is evident in Figure 4. The normal cross-isobaric component of the winds contributes further to the off-shore transport of cold continental air. The anticyclone waxes and wanes in intensity during the season in response, principally, to pressure changes aloft produced by

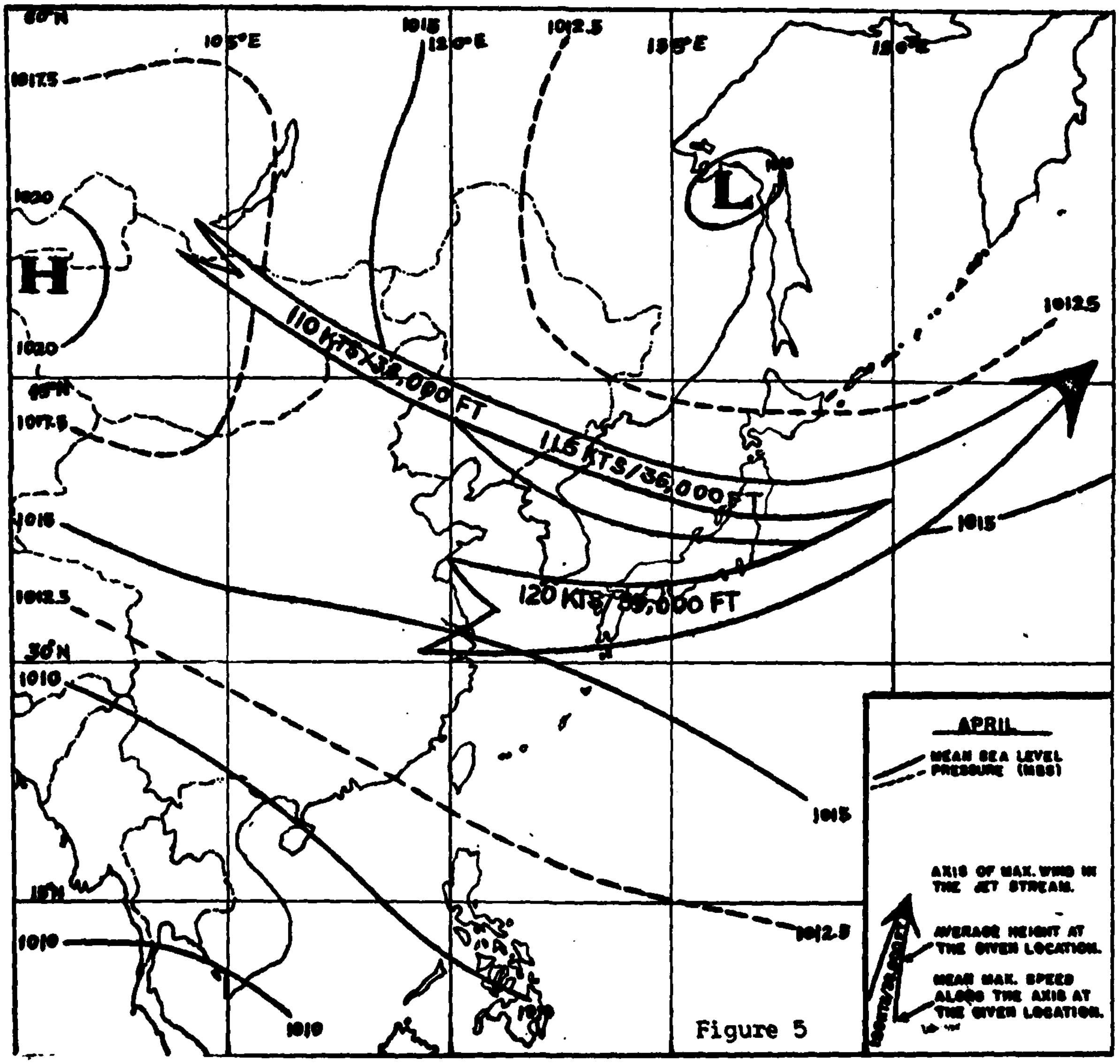

Figure 5

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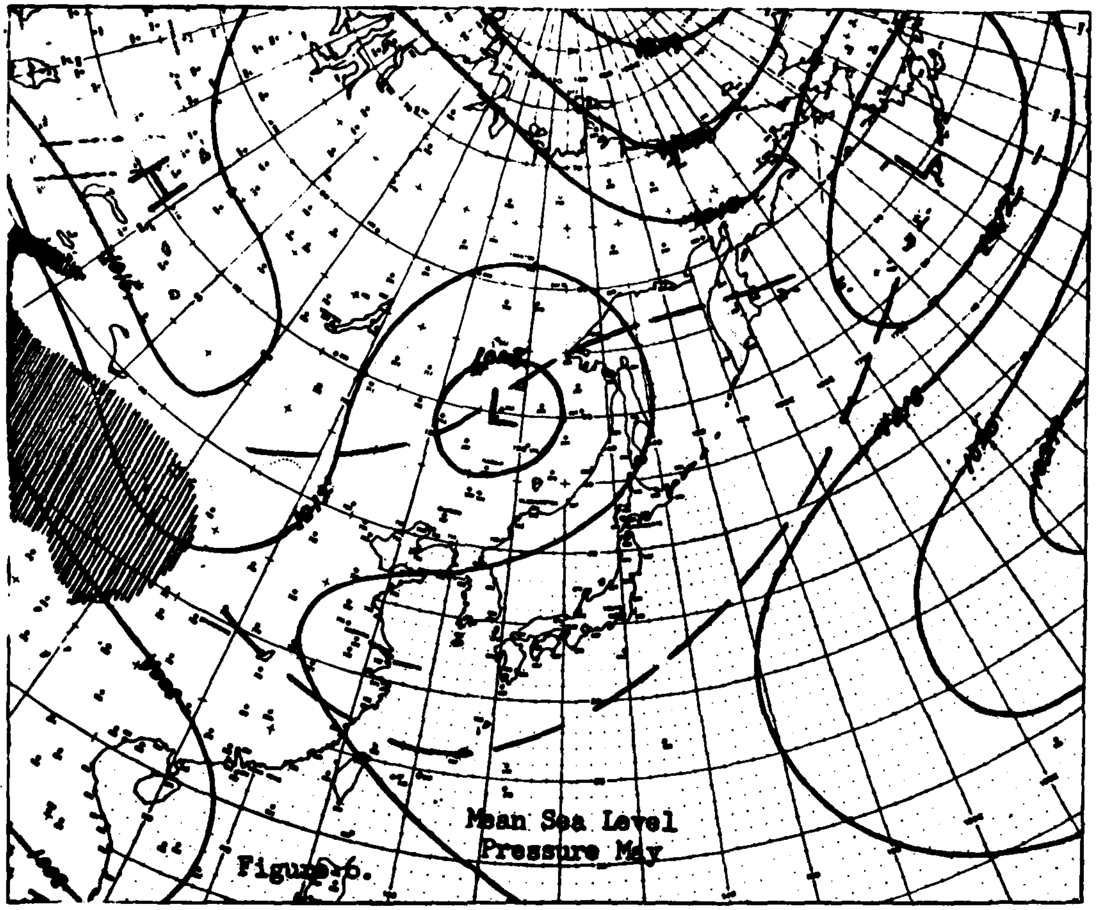

Figure 6.

traveling mid-tropospheric disturbances. The exodus of cold air occurs in "surges", interspersed with periods of only weak off-shore flow. Strong cold fronts mark the leading edge of each "surge" but true warm fronts rarely accompany the disturbances.

The Siberian high is at its maximum intensity in January and is usually a shallow, cold dome with sinusoidal westerlies aloft. The thickness of this high pressure cell generally varies between 6000 and 8000 feet, (See Figure 10), although at times closed high cell circulations can exist to 300 mbs. During the winter months of January and February the western

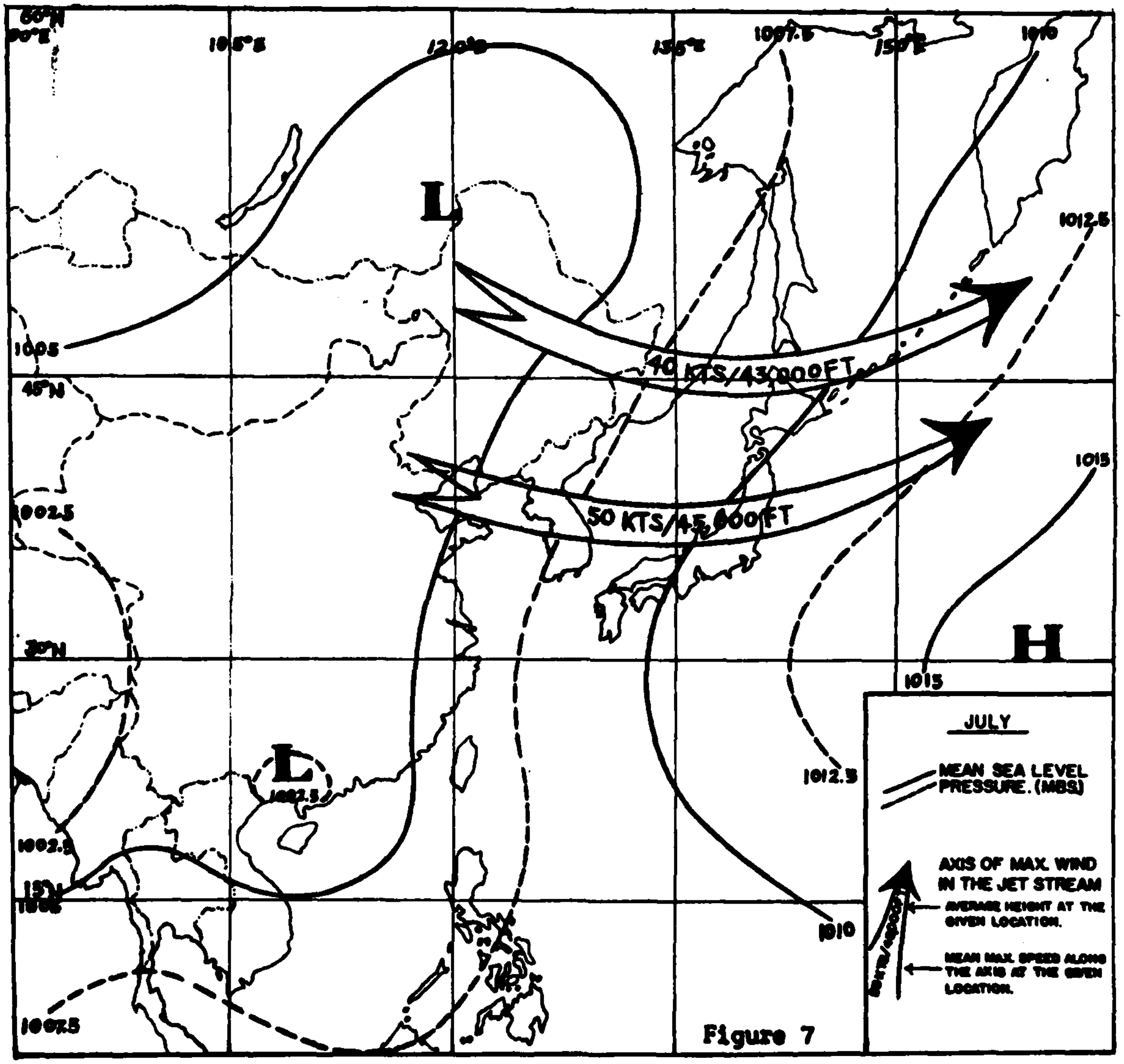

Figure 7

extension of the Pacific high is weak and has retreated southeastward to the East Pacific. In contrast is the Aleutian low which is at maximum intensity over the West Aleutian Islands. As winter ends and spring begins, temperatures over Southeast Asia moderate and the Siberian high cell weakens and recedes northwestward, (See Figure 5).

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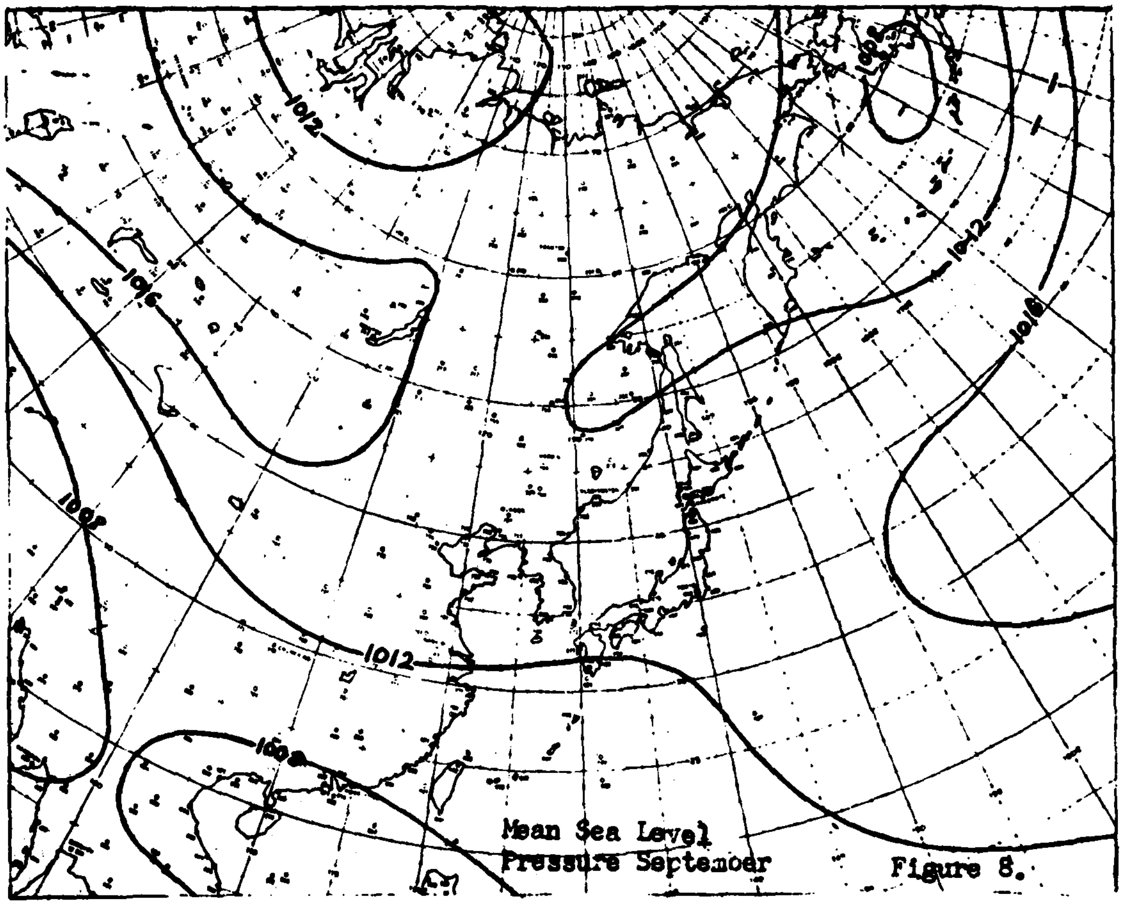

Mean Sea Level Pressure September Figure 8.

During May, (Figure 6), it is no longer a high cell and at this time a heat low begins to appear over Northeast Manchuria with the Pacific high intensifying westward and the Aleutian low weakening. The "Thar" low of northwestern India is generated also at this time.

By July, (See Figure 7), the summer monsoon reaches its maximum intensity and sea-level pressure over the continent drops to its annual minimum (1002 mbs). The prevailing flow is onshore; the "Thar" low has moved west from its May location; and the Aleutian low has become an extension of the East Asian trough.

During September, (Figure 8), the summer monsoon weakens and a high of weak intensity forms over Central Asia. The extension of the Pacific high recedes eastward progressively during autumn and the Aleutian low strengthens, (See Figure 9). By December the winter monsoon has reached its maximum intensity.

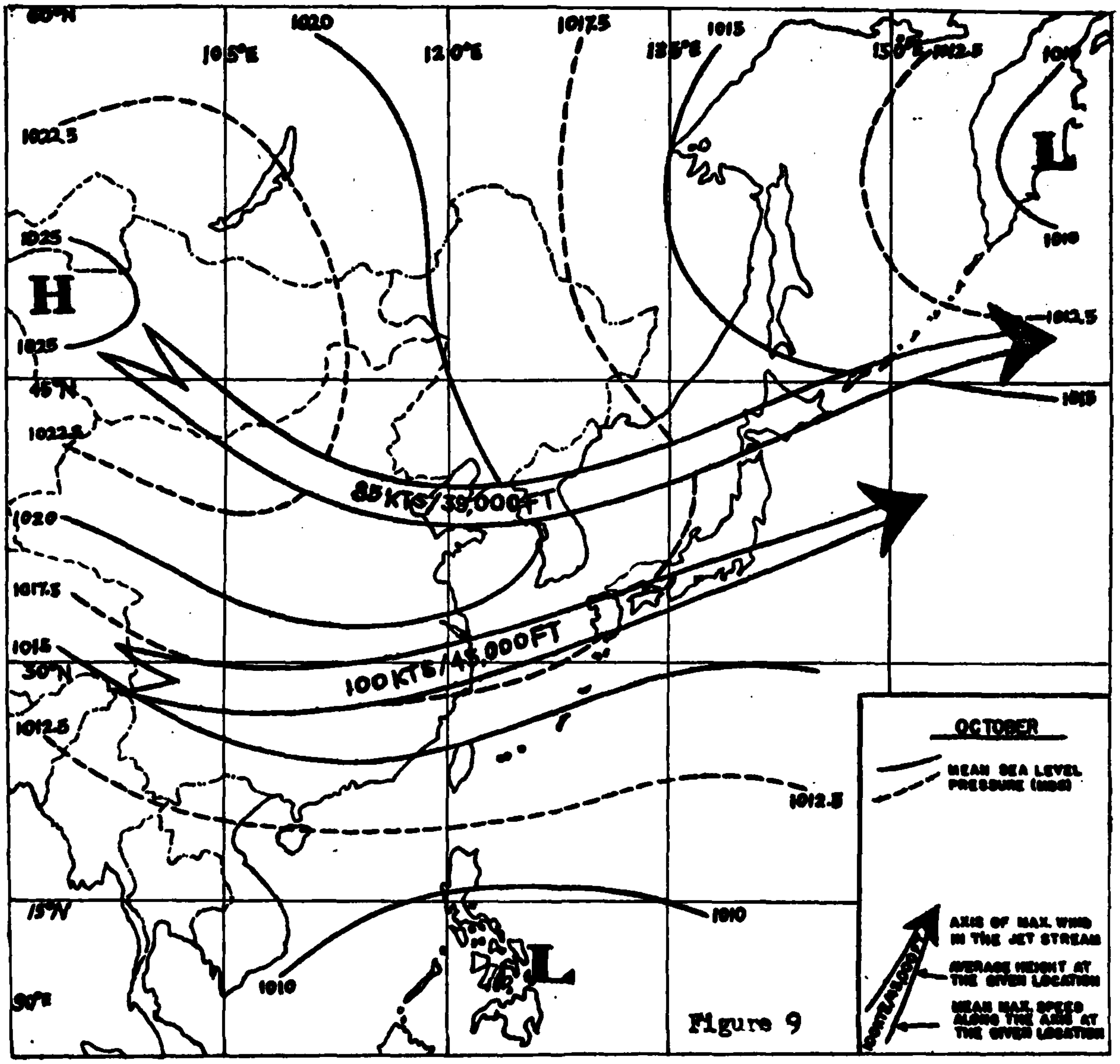

Figure 9

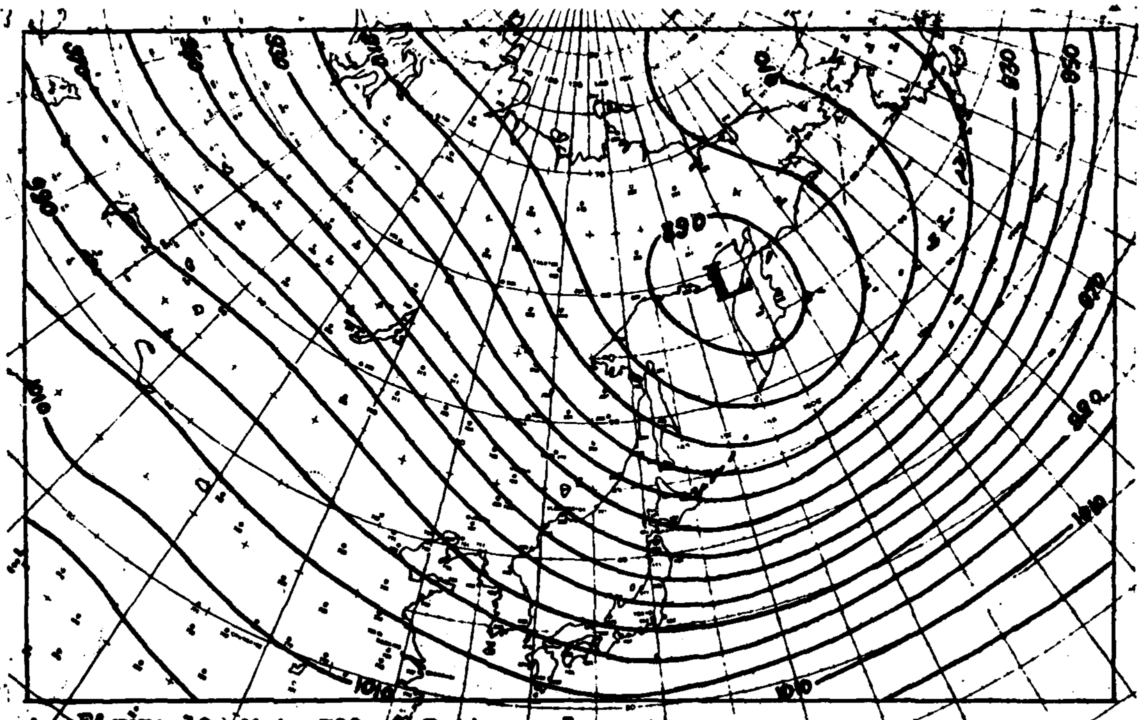

Figure 10. Mean 700 mb Pattern January

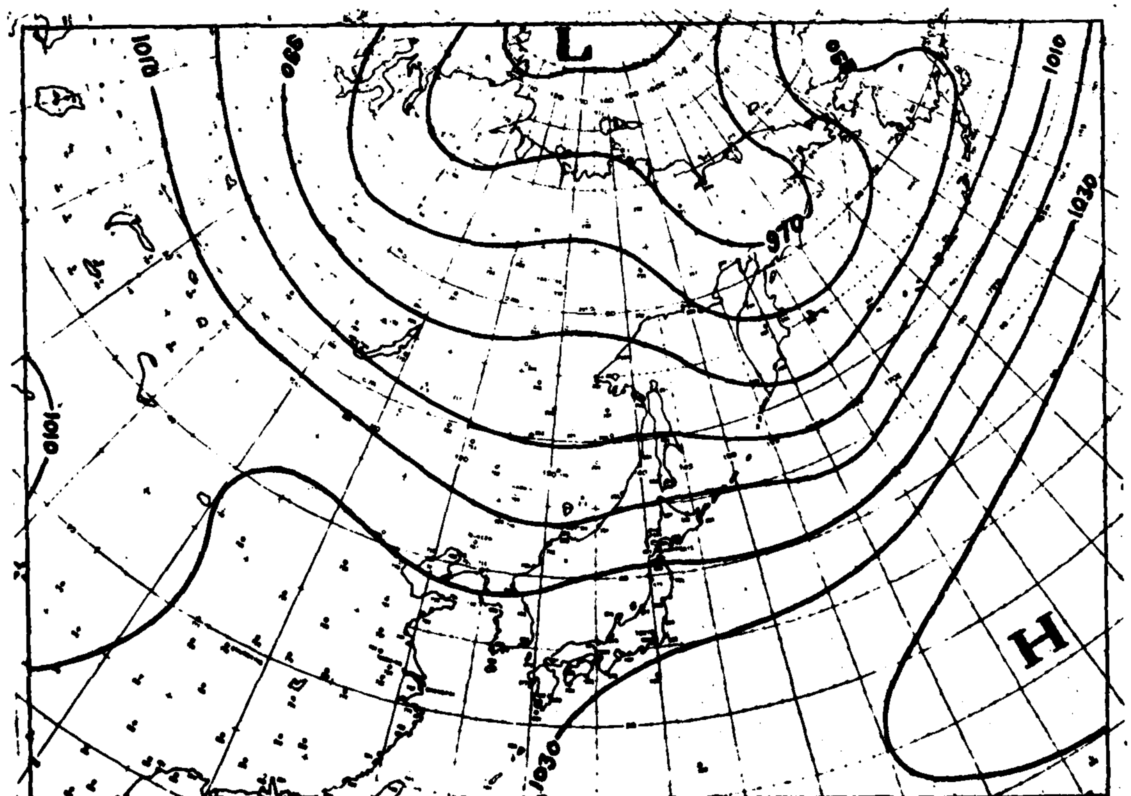

Figure 12. Mean 700 mb Pattern July

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4. EAST ASIA NORTHWEST PACIFIC AIR MASSES

Continental Polar (cP), Maritime Tropical (mT), and Maritime Polar (mP), are the three main types of air masses in the East Asian-Northwest Pacific area (See Figure 12).

Continental Polar air dominates the area in winter. At its central Asian source it is cold, dry, and usually has a strong low-level temperature inversion. Surface temperatures vary between 15° and -40°F. Although mixing ratios seldom exceed one gram per kilogram, low temperatures cause relative humidities to reach 75 and 85%.

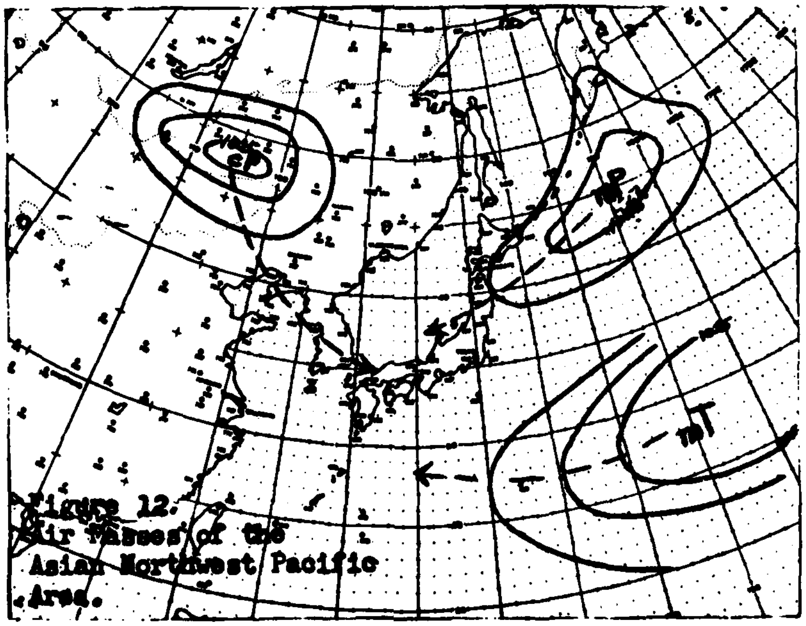

Figure 12. Air Masses of the Asian Northwest Pacific Area.

The southeastward and generally downslope trajectory of (cP) air from Siberia and Mongolia causes its temperature to rise rapidly as much as 25°F while over land. It continues to warm and take on moisture in its lower layers after reaching the sea and is usually convectively unstable upon arrival over Japan and the Ryukyus Island areas. The effect of the warm Tsushima current further intensifies the warming and contributes to the saturation of the air. Broken to overcast low cloud decks of stratocumulus and cumulus abound over the eastern areas of the Sea of Japan and windward of Japan's mountain chains. Snow and/or rain showers are numerous and frequent. In general, the clouds do not extend above 5,000 or 6,000 feet; at times, however, over the warm ocean currents, they attain much greater thickness. As a rule, the

colder the air, the greater is the heating and resultant cloud build-ups. As the cP flow crosses the Japanese mountain chains it is dried out and further warmed, resulting in spells of fine clear weather on the eastern slopes.

Frequently, the leading edge of a cP "surge" will become stationary a short distance off the southeast coast of Japan and assume an ENE-WSW orientation coincident with a belt of strong packing of sea-surface isotherms. The front thus tends to be sustained and cyclogenesis is likely to occur to the southwest of Kyushu if an upper level trough traveling in the mid-tropospheric westerlies approaches the area. In some instances, development of a depression may occur even in the absence of recognizable cyclonic vorticity advection aloft. A sharp eye to pressure tendencies and the growth and movement of precipitation areas is necessary to detect an imminent development of this sort. Synoptic situations involving wave cyclogenesis with these cP winter monsoonal outbreaks do not usually occur on the primary Polar Front but within zones of discontinuity between fresh and modified cP air (See Figure 13).

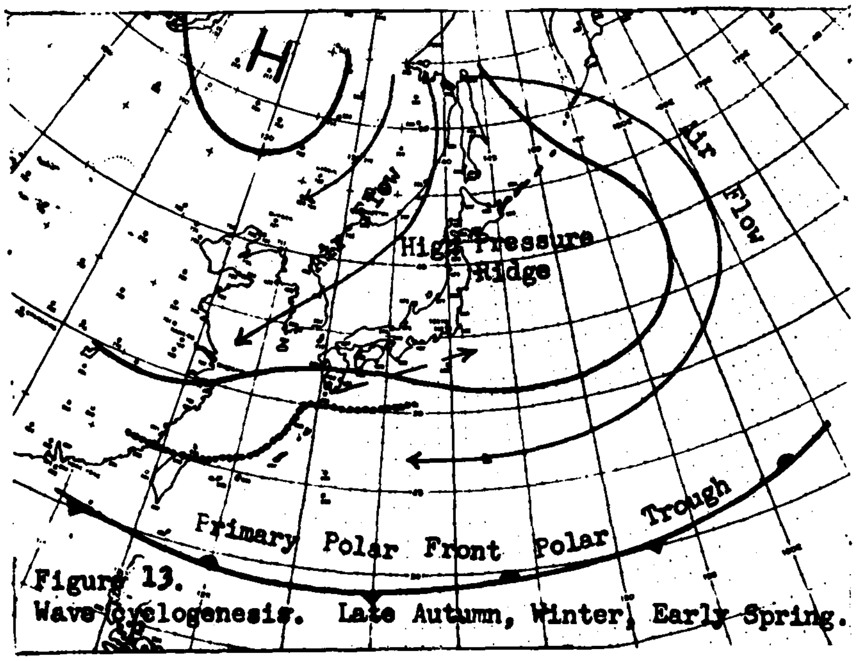

Figure 13.
Wave Cyclogenesis. Late Autumn, Winter, Early Spring.

More often than not, the latter will possess greater density contrast than that across the primary polar front to the south. Moreover, the thickness pattern will have shown a progressive change in the intensity of packing to support frontolysis along the southern front; frontogenesis along the northern. Successive facsimile analyses may therefore portray

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an apparent huge "jump" in the position of the front (quite inconsistent with the maximum possible advective movement) and recipients of the charts are apt to be confused. Delineation on an intermediate chart of frontolysis in the south, frontogenesis in the north seems the most practicable way of overcoming this difficulty in analytic convection.

During spring and autumn outbreaks of cP air occur which are caused by the migration of highs across Eurasia. When an outbreak is from China it causes considerably different weather from that caused by one moving south and south-eastward from Manchuria and eastern Siberia. The China outbreak is usually a warmer and deeper system with anticyclonic circulation reaching considerable heights and covering a larger area.

Most all (cP) outbreaks flow for considerable periods of time over an ocean trajectory. The trajectory of any particular outflow determines to a great extent the degree of its modification. An outbreak from Northeastern Siberia to Hokkaido requires but several hours and is but slightly changed, while one from central Asia takes several days and becomes considerably "maritime modified".

The (cP) source region is displaced northward during the prevailing summer monsoon, and cP air affects the area south of 40°N infrequently.

True maritime Polar, (mP), air is infrequent. Its source region is the waters north, northeast, and east of the Japanese islands. Outbreaks of mP air occur at times in late spring, summer, and early autumn.

The northern boundary of mT air is kept far to the south and east of China and Japan during the cold season by the persistent winter monsoon. It alternately advances and then retreats during the latter part of spring and usually makes a sweeping advance to as far north as central Manchuria during late June and early July. It retreats with great rapidity during early autumn. This air is generally moist and convectively unstable which are conditions conducive for cloud build-up and thunderstorm activity in and about Japan, China, and Southeastern Asia.

5. ASIAN-NORTHWEST PACIFIC LOW CELLS AND THEIR TRAJECTORIES

Figure 14 shows the principal tracks of Low cells that move across the Asian-Northwest Pacific area between 25 and 65°N. One of these, Track C, is situated through the East China Sea South of Japan and into the North Pacific. A second, Track E, lies through the Sea of Japan and across northern Japan and Sakhalin. At higher latitudes, lows tend to move along Track A. The Lake Baikal or "Kwang Ho" lows move along Tracks B and D passing sometimes over the Korean peninsula, sometimes north of it, through the Sea of Japan northward over Hokkaido. They form frequently through "Cyclogenesis at the base of an occlusion" or through "Cyclogenesis at the peak of the warm sector," (Petterssen).

Some track D lows have the trajectory eastward around the northern edge of the Tibetan Plateau and are not related to high latitude lows.

Low cells which move along trajectories C and E often develop as wave cyclones on slow moving or stationary fronts situated east-west through China and adjacent northwest Pacific Ocean areas.

Best's [1] Table 2, Extratropical Cyclones, is included for further reference.

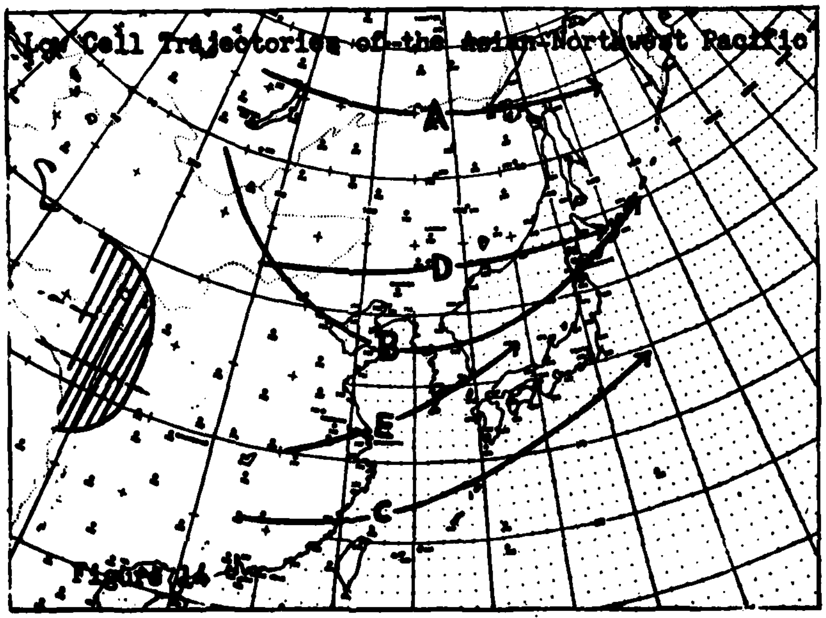

TABLE 2

Extratropical Cyclones

TRACK	SEASON	FREQUENCY PER YEAR	CHINESE CLASSIFICATION	(4) RELATED WEATHER TYPE
A	All	20	None	5
B	All, spring maximum	25	"Baikal" Low "Hwang-Ho" Low when track is south	5 5
C	All, winter & spring maximum	27	"South China" & "Eastern Sea" Lows	2
D	All	20	"South Mongolian" Low	5
E	All, spring, early summer & fall maximum	9	"Trans-Yangtze" & "Central Mountain" Lows	3

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6. HIGH CELLS OF THE EAST ASIAN-NORTHWEST PACIFIC FORECAST AREA

a. Migrating High Cells: The three seasonal generalized high cell trajectories, (See Figures 15, 16, and 17), show that most highs in all seasons follow a general southeastward, and then eastward, northeastward course across Japan. During the December through March period, (Figure 15), high cells move south and southeastward from southern Siberia and Mongolia into northeast China where they recurve eastward across Japan.

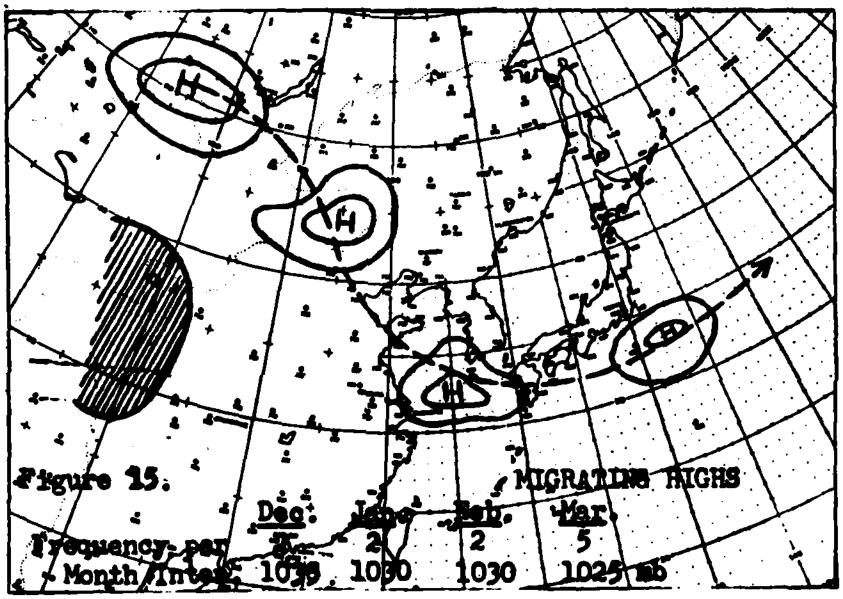

Figure 15.

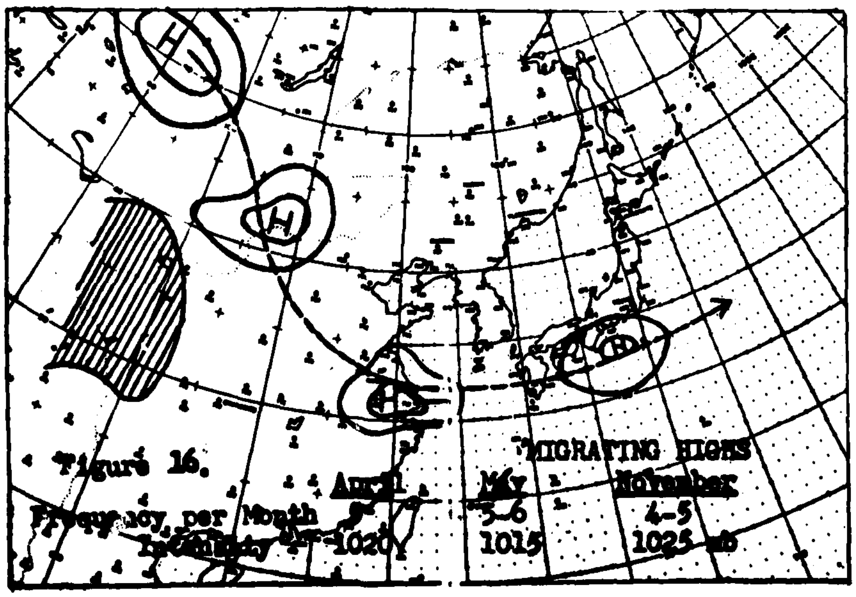

Figure 16.

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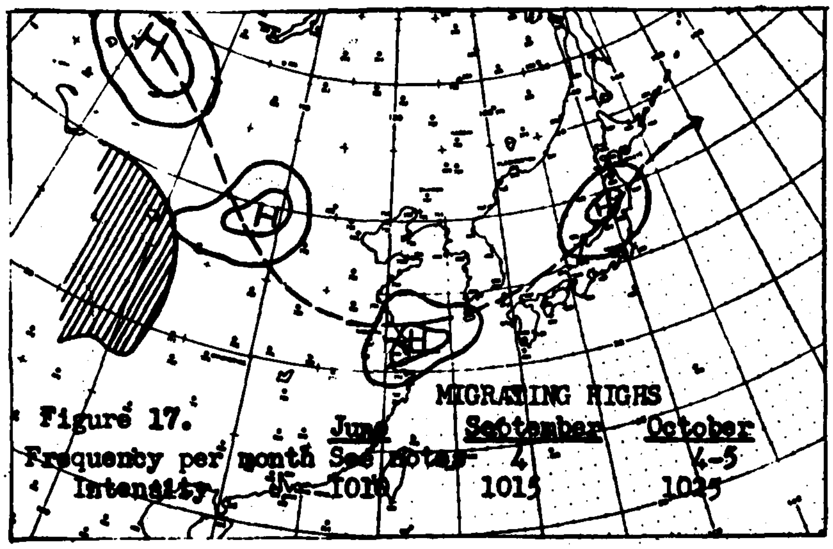
The April, May, and November Track, (Figure 16), shows southward movement of the high cell further west to the Yangtze Valley area where it recurves eastward across southern and central Japan. At times during these months northward deviations of track through the Tsushima Strait into the Sea of Japan occur. This irregular course is usually temporary and most cells return to the normal track via a southeastward transit of Japan. The June, September, and October pattern, (Figure 17), shows that high centers move southeast in Asia near the Yangtze Valley and curve northeast through the Sea of Japan and across the northern Japanese islands.



The majority of high cells which follow a path different from those shown are those originating in the area between Novaya Zemla and the Taimyr Peninsula. These usually follow an east-southeastward trajectory into the area of Japan. In other instances a Lake Baikal high forms in two cells; one moves east across Siberia while the other follows the seasonal normal track.

The Lake Baikal - China area is the normal location for stagnant high cells during winter months. In early spring and late autumn, highs more often stagnate in the eastern Yangtze Valley and over the East China Sea; while in late spring, early summer, and early autumn they frequently dominate the Pacific area just east and southeast of Japan. During early spring and late autumn highs moving out of China

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do not normally subsequently stagnate over the forecast area. The following facts are pertinent to high cell behavior:

(1) As a high cell increases in intensity its tendency to stagnate also increases.

(2) It is unlikely that highs will stagnate if they are not situated in the normal location for the period of the season in which they occur.

(3) Cold, shallow high cells move more rapidly and have less tendency to become immobilized than warm core, deep systems which move slowly and have considerable stagnation tendencies.

b. Other High Cell Formations:

(1) It is common during the winter for a "bubble" high to break off from the Siberian High in the vicinity of Japan and move eastward (See Figure 18, Surface Map 1230Z, October 24, 1948).

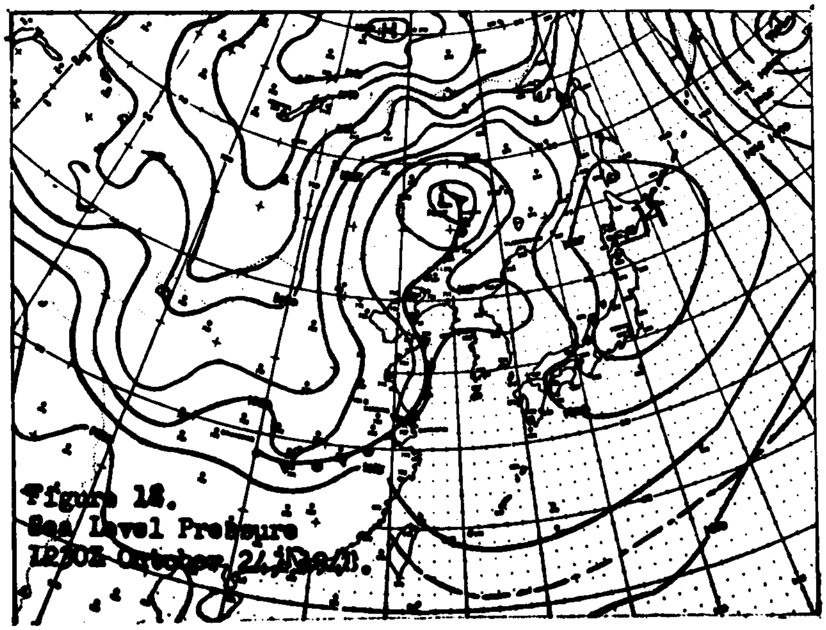

Figure 18.
Sea Level Pressure
1230Z October 24, 1948.

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(2) During late spring, summer or early autumn high cells sometimes move southward into the forecast area from eastern Siberia or the Bering Sea area, (See Figure 19, Surface Map, 1230Z, July 2, 1948). Developments of this sort tend to be persistent and usually are accompanied by dismal weather along eastern Honshu.

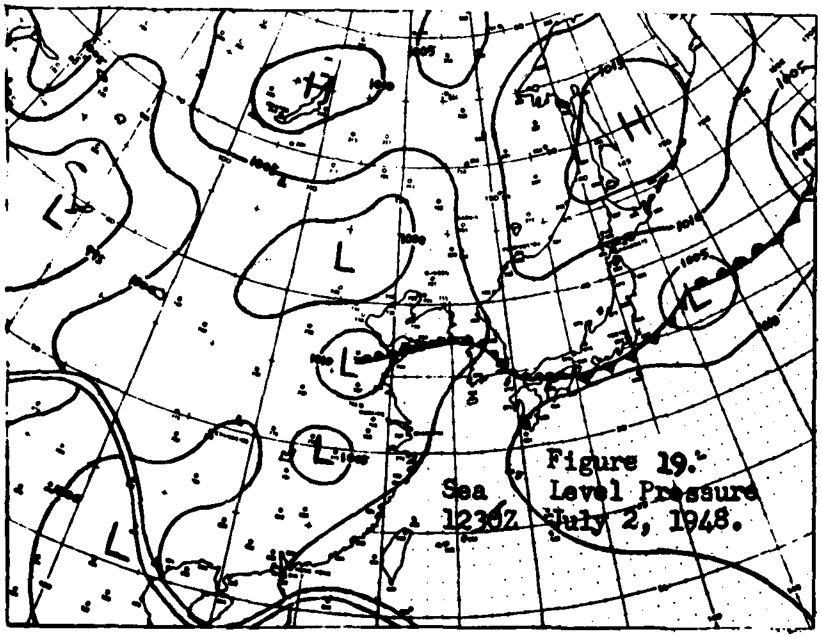

Figure 19. Sea Level Pressure 1230Z July 2, 1948.

(3) High cells have, in some synoptic situations, been observed to move south from Arctic-Polar regions east of 120°E.

(4) Other High cells are generated over areas of the East Asian coast. They are observed during spring, summer, or autumn and have no land trajectory. They may first appear as a single closed isobar in the vicinity of the East China or Yellow Seas; or they may form as a section which has broken off an mP high northeast of Japan. When one forms, it can be expected to either breakdown and disappear or move northeastward to rejoin the mP high from which it came.

The above high cell situations are ones of a singular nature. They are not as commonly observed as those which enter the forecast region following a lengthy history of movement over Europe and/or Asia. Individual highs of this large migrating group are usually major weather features and their centers have continuity for three to five days. Best's [1] Table 3, Monthly Frequency of Migrating Highs from Asia, is included for further reference.

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(2) During late spring, summer or early autumn high cells sometimes move southward into the forecast area from eastern Siberia or the Bering Sea area, (See Figure 19, Surface Map, 1230Z, July 2, 1948). Developments of this sort tend to be persistent and usually are accompanied by dismal weather along eastern Honshu.

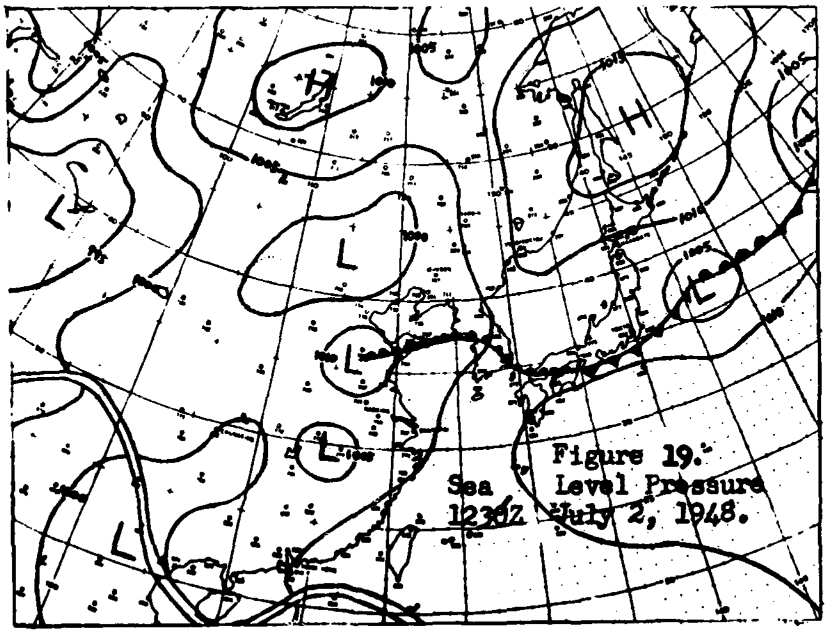

Figure 19. Sea Level Pressure 1230Z July 2, 1948.

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TABLE 3

Monthly Frequency of Migrating Highs from Asia

MONTH	MEAN*	MONTH	MEAN*	MONTH	MEAN*
January	2	May	5-6	September	4
February	2	June	**	October	4
March	5	July	0	November	4-5
April	5	August	0	December	2

* Mean frequencies are based on the following references:

Orton, R.B., "The Paths and Characteristics of Migratory Anticyclones in Southeast Asia," USAAF Weather Central, Hsinching, China, 1945

Aota, T., "Europe-Asia Analysis Chart", Kenkyu Sokuho No. 30, Central Meteorological Observatory, Tokyo, 1948

** Variable and unreliable from forecasting standpoint.

7. THE POLAR TROUGH-POLAR FRONT

Of vital interest to the forecaster in the Asian-Northwest Pacific area is the Polar Trough-Polar Front. It is a sometimes-discontinuous zone varying considerably in intensity and character of associated weather at different latitudes due to effects caused by the configurations and contrasts of the Asian continent and the Northwest Pacific.

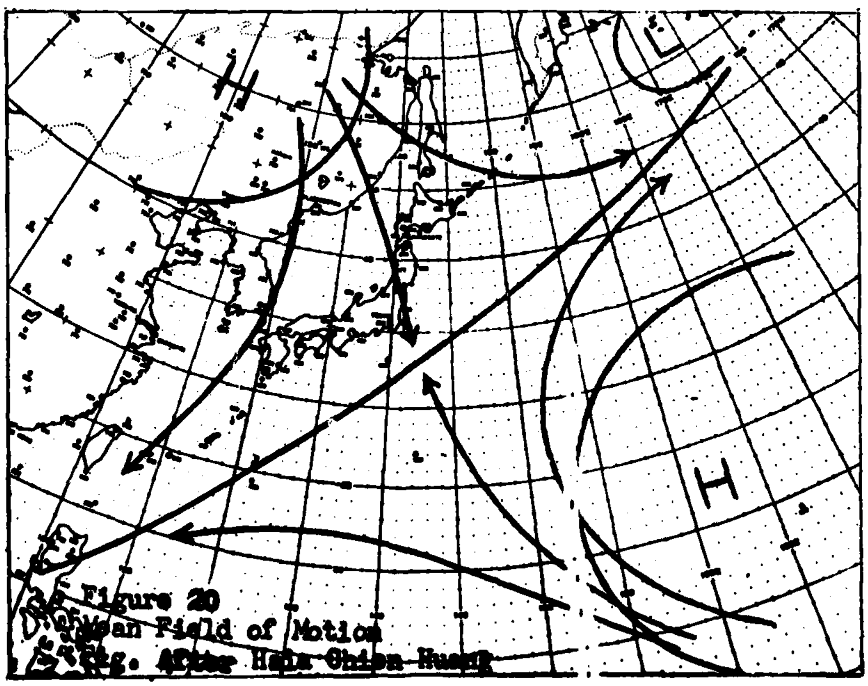

Figure 20
Mean Field of Motion
Fig. After Hsia Chien Huang

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Generally, this zone extends from the Aleutian Low southwestward parallel to the East Asian Coast line.

When a narrow, well defined boundary marks the leading edge of the Polar air it is classified as the Polar Front; at other times the zone is one of a gradual transition and is referred to as the Polar Trough. Figure 20 shows an idealized motion and temperature field for the generation of frontal-trough lines.

It is of major importance in forecasting to determine the behavior of systems forming along this boundary; and in order to do this the following considerations are helpful:

(1) Often, there appear to be two Polar Trough-Polar Frontal systems, (See Figure 21). The first is commonly known as the Primary Polar Trough-Polar Front system and the one to the north as the secondary system, which at times is called the Arctic Front. South of the primary system is the pure tropical air mass; and north of the secondary system fresh Polar or Arctic air is found. The air between is modified continental polar. The temperature and moisture content of its lower few

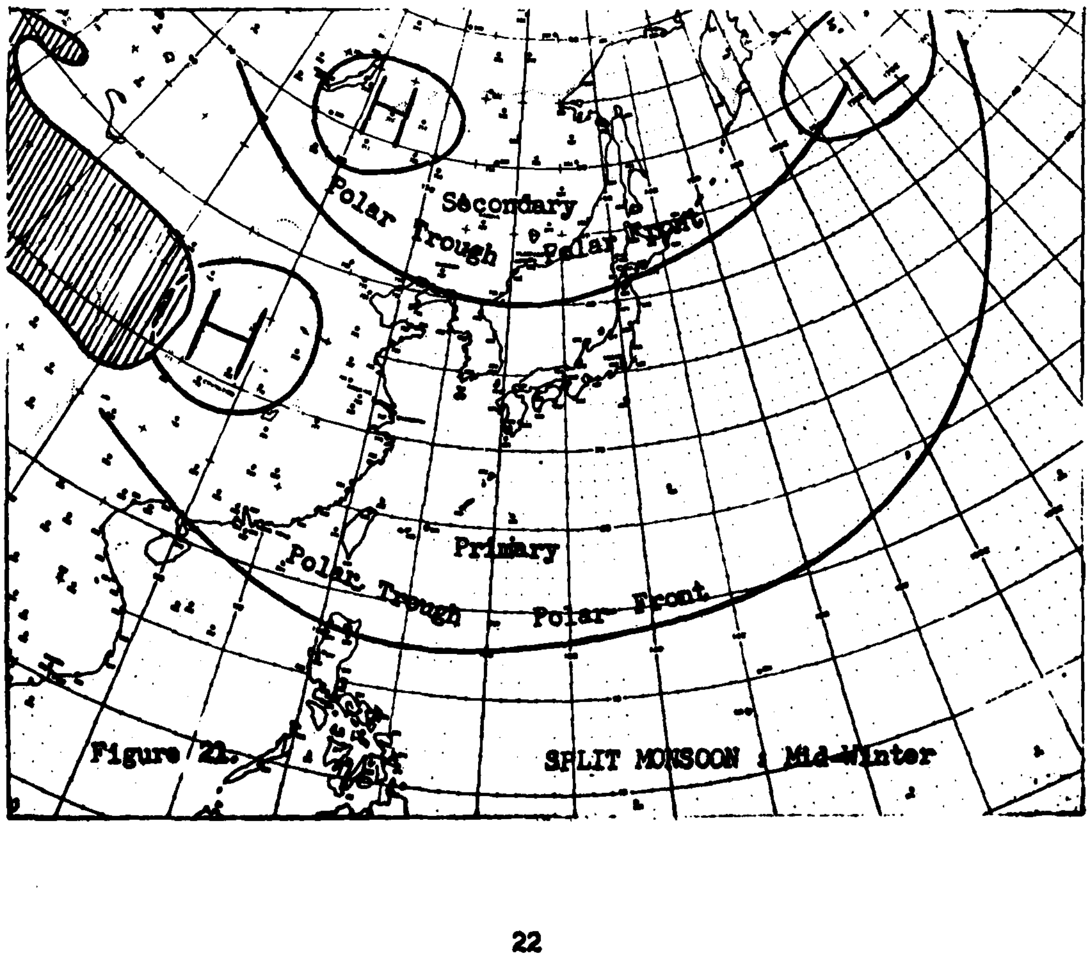

Figure 21. SPLIT MONSOON - Mid-Winter

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thousand feet have been greatly increased where it has been in contact with the sea surface.

(2) Both Primary and Secondary systems are zones favorable for the processes of fronto-genesis and cyclogenesis. East, southeast, and southward moving cold fronts from the Asiatic continent find ideal locations to stagnate and develop perturbations along sections of both trough systems, and this is especially noticeable along sections of the Primary system.

(3) When a cyclone develops, the track of its center usually veers north of the mean location of the Polar Front-Polar Trough. Figure 22 shows successive positions of an occluding wave. During March, the mean position of the primary Polar Trough-Polar Front is from near Iwo Jima to south of Formosa and thence into southern China. The usual track for developing Low cells is to the east and northeast from southern China gradually turning left of the Primary trough line as the wave occludes. Consequently, Low cell trajectories coincide with the Primary Polar trough in the Eurasian-Northwest Pacific forecast area and become displaced to the north of it in eastern parts of this area.

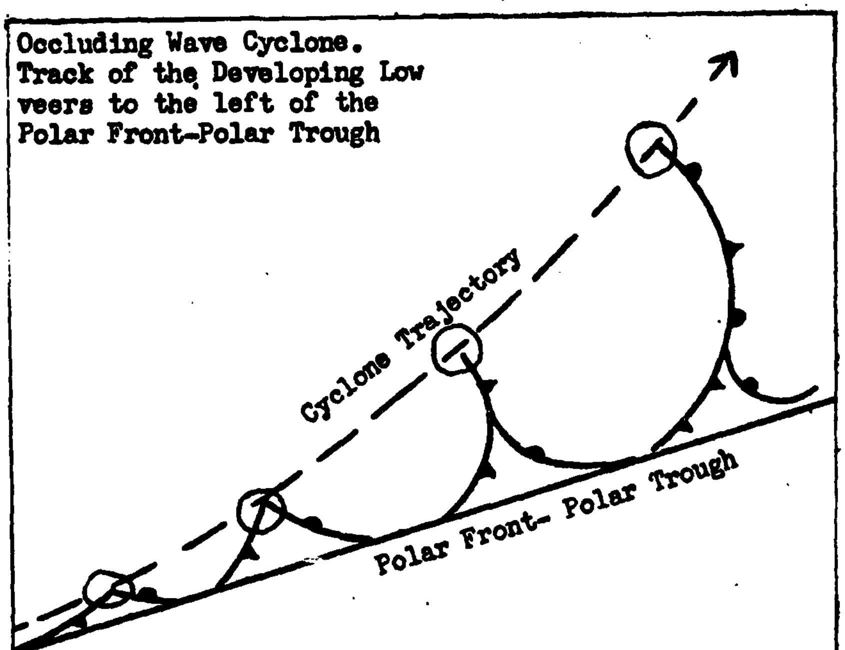

Figure 22.

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(4) Both systems migrate north and south under the influence of the monsoon circulation. In autumn the movement is southeast and southward as a result of the pressure build-up of Siberia; while during spring they reverse their direction and move northwestward. In summer, usually only one system is recognizable. It extends weakly from central Manchuria eastward.

(5) In addition to the seasonal oscillations, both systems undergo short-period oscillations as well. As an example, during spring and autumn, when migrating high cells are common, the Primary system is often displaced southward ahead of such a high. This oscillation can be as large as 800 to 900 miles. At times during an intense cP winter outbreak from Asia, even the Secondary system may be displaced south of Japan.

8. ASIAN-NORTHWEST PACIFIC WEATHER TYPES

Synoptic situations which look alike, develop in similar ways, and produce the same sort of weather over selected areas are often grouped and classified as weather types. The original typing of the East Asia-Pacific area was accomplished in 1944 under CIT-AAF Project 1. The types were based on sea level analyses for the period 1899-1939 as contained in the Northern Hemisphere Historical Map Series. Twelve types were originally identified, based primarily on the trajectory of low centers, general flow patterns, and positions of wave developments or frontal zones. Extensive revisions through the years have reduced these twelve types to seven.

We will present a brief discussion of these seven types for the value they should have in orienting the forecaster to the general pattern of weather in this area. It has been found difficult to use weather types as forecast tools since they are hard to recognize in their early stages of development, they change from one to another, and there are often variations of the same type with totally different weather effects in any particular area. However, they should be useful to the detachment forecaster in fixing the broad scale synoptic pattern and associating the smaller scale features of his sectional map with this large scale pattern. They will often give a clue as to the persistence or repetition of a type of small scale pattern which would depend on the persistence or change of the large scale type.

The information to be given on these types is mostly descriptive since "timing and phasing" have not been well developed. Also given are the mean frequency occurrences by season and the area weather effects. Local weather at any particular terminal must necessarily be studied separately due to the effects of terrain and topography.

I. Weather Type I

1. The two major features of this type are:

a. A shallow quasi-stationary Siberian anticyclone centered over southern Siberia and Mongolia (See Figure 23). Its sea level surface pressure is less than 1050 mbs. (This rule separates it from a Type IV situation.) A ridge or closed high may exist to 700 mb but the anti-cyclonic circulation does not extend to 500 mb.

b. A trough, which has had no history on the surface chart in central Asia, moves eastward as a surface feature while regeneration possibly accompanied by frontogenesis occurs. This usually occurs parallel to and near the Asian coast with the front or trough proceeding eastward and southeastward across Korea, Japan, and the Northwest Pacific.

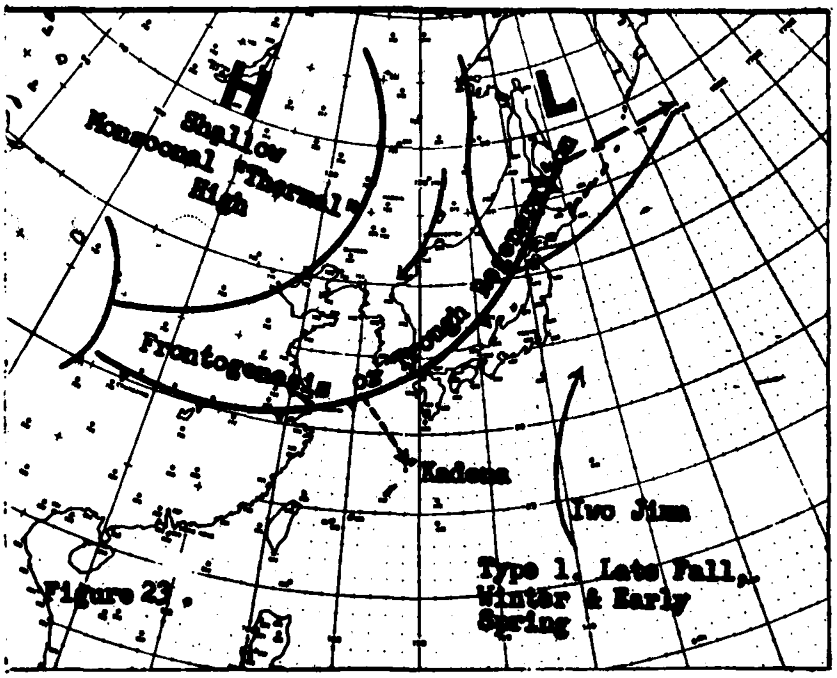

Figure 23.

2. Type I is a late fall, winter or early spring phenomenon:

When the quasi-stationary, shallow high exists, all upper level troughs moving eastward in the westerly flow aloft should be extrapolated forward and surface regeneration suspected. While the trough remains aloft over the high there is often little surface indication of its

presence except for an area of poor weather confined to the more northerly latitudes. The first clue to its surface regeneration are the surface pressure tendencies along the eastern edge of the high. Occasionally when the quasi-stationary high is elongated in an east-west direction, a small "bubble" high will break off from the main center with the trough forming behind it. (See the example in Figure 24.)

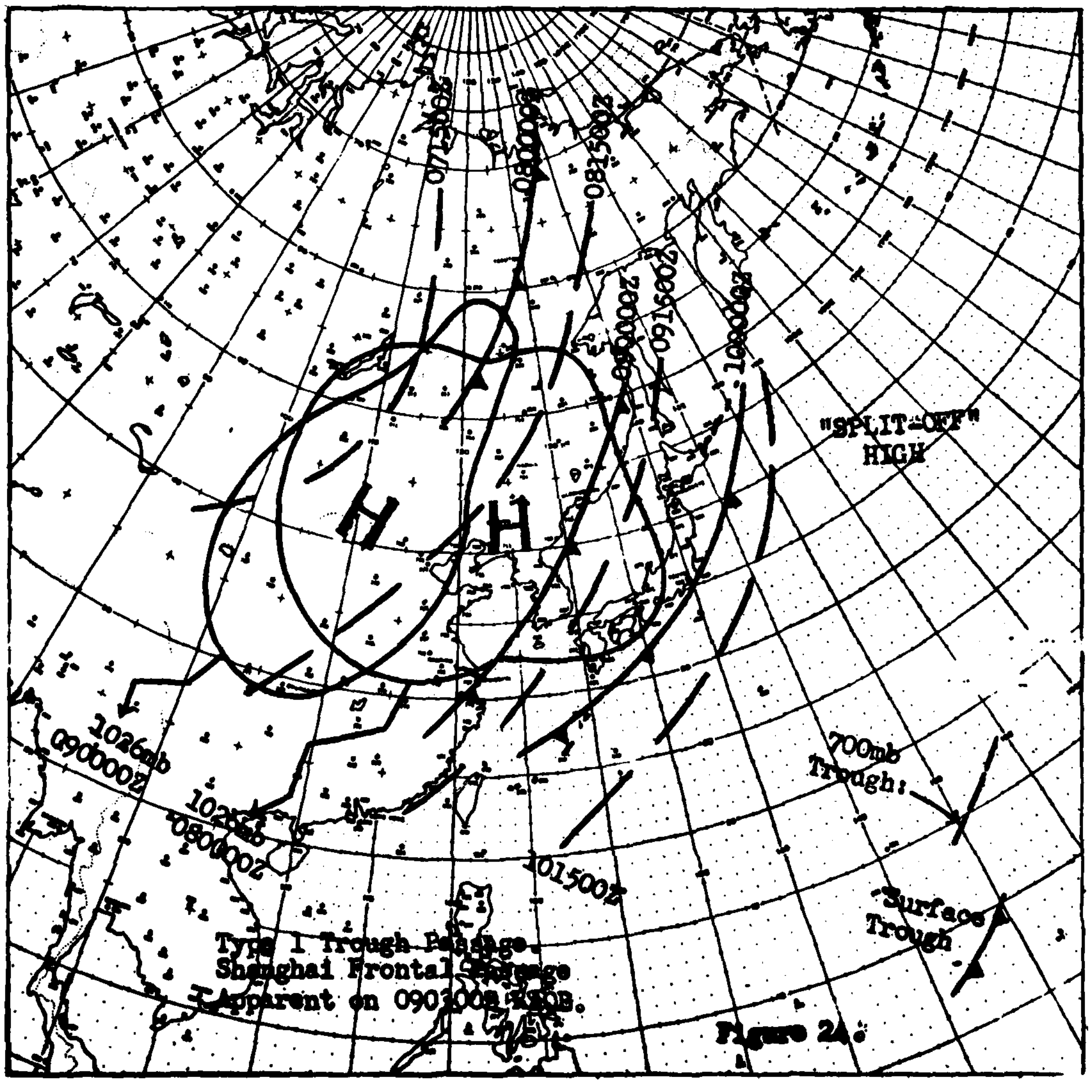

Figure 24.

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3. The weather associated with Type I can be generally categorized as follows:

a. Considerable cloudiness and showers over the windward areas of Japan, Sakhalin, the Ryukyus and adjacent waters.

b. Generally fair conditions over Korea, Central and Eastern China, and lee side areas of Japan.

c. A large area of cloud and precipitation associated with the upper trough over the Asian mainland north of about 45°N.

d. Low cloudiness and precipitation associated with the surface front over the Pacific and over southern and southeastern China as the front stagnates over this area.

II. Weather Type II

1. The major features of type II are:

a. A low center or wave on the polar front, (See Figure 25), develops over South or Central China or the East China Sea and moves eastward and east northeastward. Its trajectory is south of Japan or, more specifically, south of the Japan divide. Since weather type II may occur in any season, there are no characteristic features of the synoptic pattern over the Asian mainland associated with it.

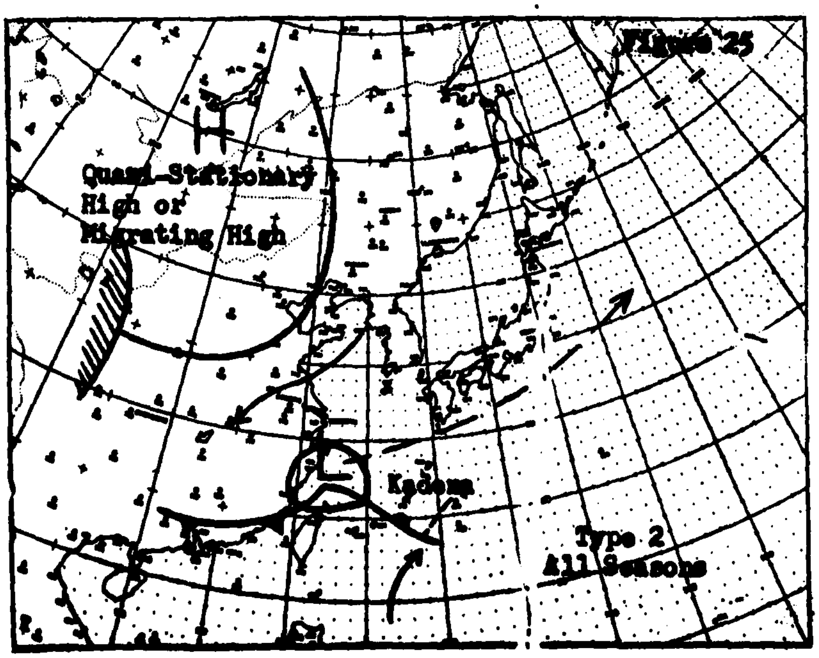

Figure 25

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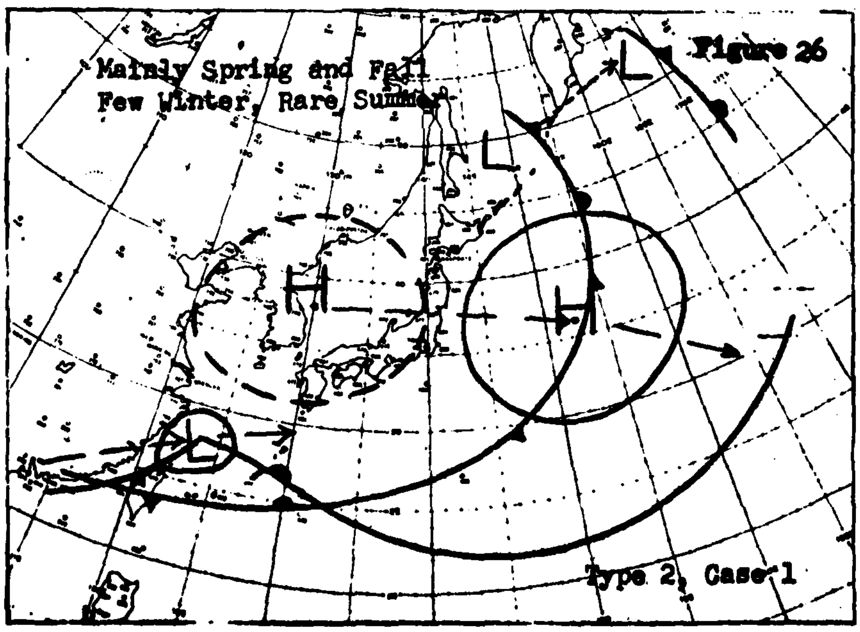
2. Type I[I] is most frequent during fall, winter and spring when the polar front lies south of Japan and across South and Central China. There are several conditions favorable for wave formation on the front resulting in a type II low.

a. In spring, fall and occasionally in winter, a migratory high moves eastward across Japan following the polar front. As the front stagnates in its southern portion over South China, a type II low will form and move northeastward along the front behind the high. (See Figure 26, Type 2, Case 1) Extensive pre-frontal high level cloudiness will usually develop rapidly as soon as the ridge line passes.

b. A second favorable condition for formation of a type II low is a quasi-stationary polar front lying between 15-25°N with a moderate westerly trough moving eastward across Asia. If the trough is strong enough, it will cause winds ahead of it to back into a southwesterly direction and "trigger" a type II low on the stationary front. (See Figure 27a, Type 2, Case 2)

c. A third favorable situation occurs during late autumn, winter and early spring with a ridge of high pressure extending southeast from the Siberian high over Japan and the Northwest Pacific. (See Figure 27b, Type 2, Case 3) Note the different air trajectories around the main high cell and the extended ridge. This type II low does not necessarily form on the polar front and it does not normally repeat itself since the over-extended ridge is usually "broken" by the first low.



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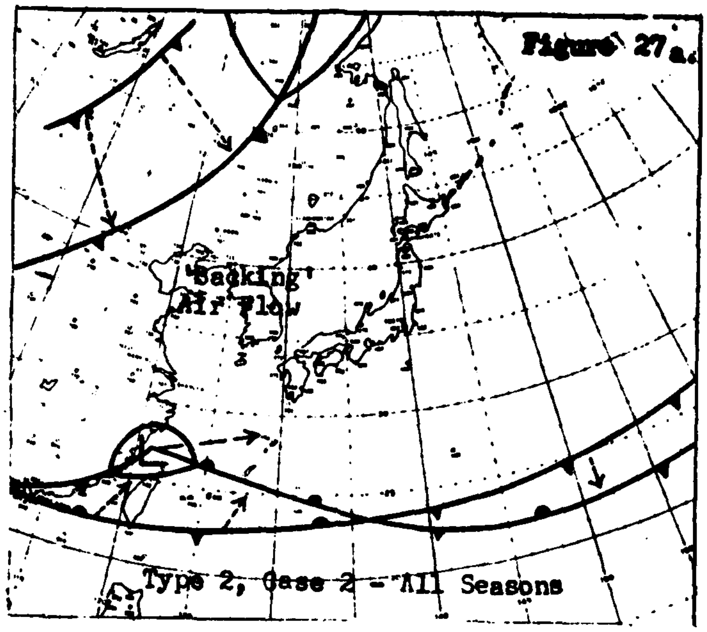
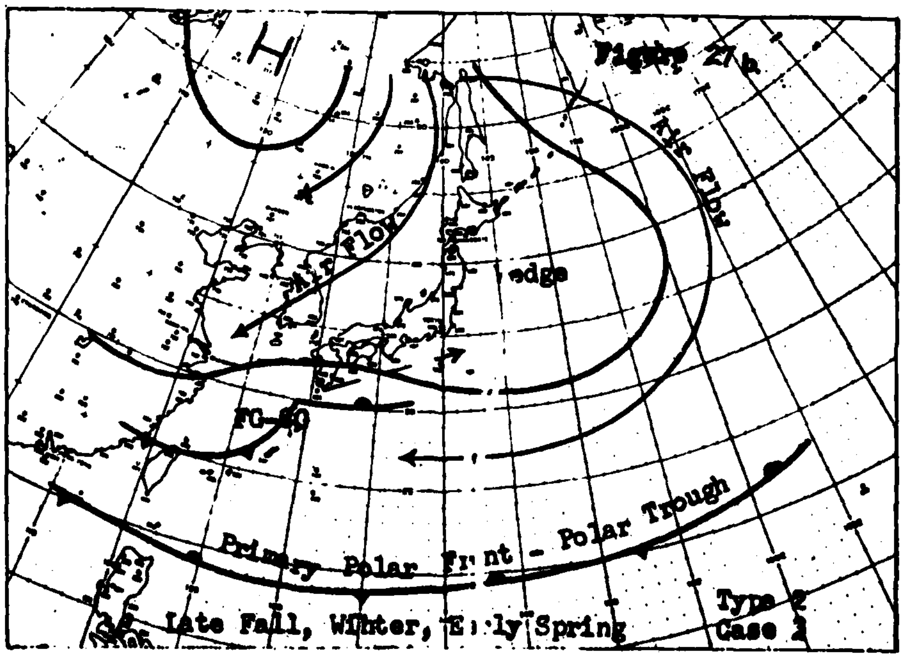
d. The fourth situation occurs in late spring, summer, and early fall when the polar front lies just south of Japan and separates the mP and mT air. A series of small stable waves move along the front and normally do not occlude until they are east of Japan.





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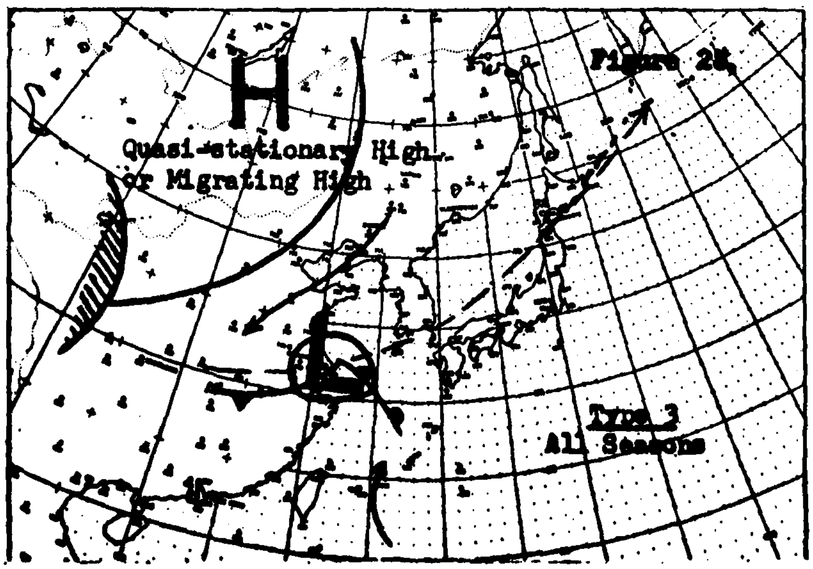
3. The poor weather associated with type II lows, low cloudiness and precipitation, is usually confined to areas south of the Japan divide, and the adjacent ocean area. However, they represent a complex problem to the forecaster because of the rapid spread of poor weather northeastward in advance of a low. Forecasters must constantly watch for early signs of wave formation over south China and adjacent sea areas. The lack of data in this area is a large part of the problem. Stable waves do not appear to have any simple type periodicity and wave lengths may vary from 200 to 800 miles. They appear to move with a mean speed of about 25 mph and should be extrapolated with the speed of the 850 mb winds over the wave center. These waves also tend to dissipate and reform in a new location so that the latest analyzed position based on data should outweigh any continuity consideration in analysis. An isotach maximum in the 850-700 mb layer has been observed to accompany the wave crest in some cases. Winds in this level have been reported to increase from 20 to 80 knots in a 12-hour period during a crest passage.

III. Weather Type III

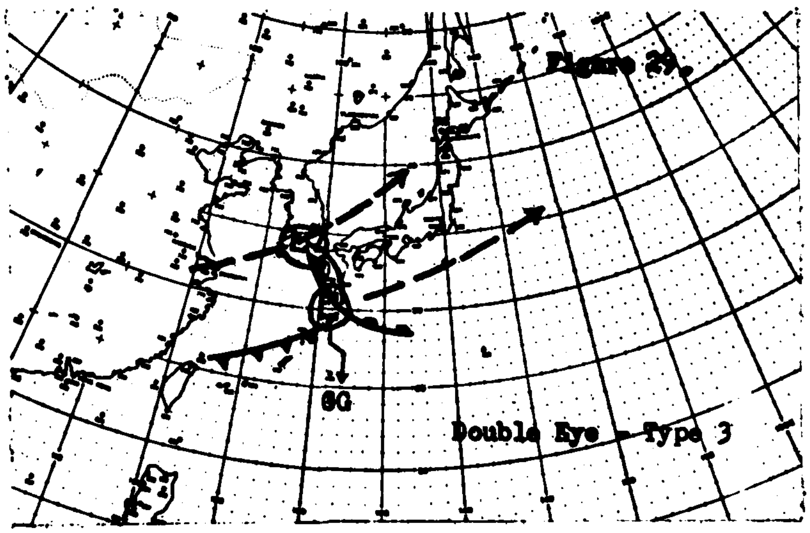
1. The principal feature of a type III weather situation is a low cell or wave which forms on the polar front or in the polar trough over central or northern China, the northern part of the East China Sea or over the Yellow Sea and moves northeastward across Korea and Northern Japan. A type III low maintains its position north of the Japanese mountain divide until it reaches northern Japan. In unusual cases, the low may first appear as far east as Korea and the Sea of Japan.

2. Type III lows appear in all seasons of the year and their formation is similar to that of a type II except that the cyclogenetic area is displaced farther north, (See Figure 28). The synoptic conditions



favorable for formation are similar to those described in paragraph II, 2a, b, c, d above.

a. A special case of both type II and type III lows is the so-called double-eye type. Examples are shown in Figures 29 and 30. In Figure 29, a type III low has moved northeastward toward Japan and occluded with the base of the occlusion south of Japan. With cyclogenesis at the base of the occlusion, a double eye forms. The new low moves northeastward as a type II low and becomes the main center while the original type III low dissipates in the Sea of Japan. In Figure 30, the double eye begins as a type II low and moves northeastward south of Japan. When its path is close to the eastern coast of Japan, a dynamically induced low forms on the other side of the mountain barrier over the Sea of Japan. The original type II low maintains itself as the primary center while the type III induced low in the Sea of Japan fills.



3. The poor weather associated with a type III low is normally confined to the northern side of the Japanese divide, the Yellow Sea, Korea, Sea of Japan, and the adjacent Asian coastal areas. However, the double eye situation produces the most widespread area of unfavorable weather of any of the types. Since the weather over the area of interest is quite different with a type II and III low, it is important that the forecaster distinguish between the two types at an early stage of development. This is extremely difficult since the conditions favorable for development are quite similar. An empirical rule states that when a low is generated over China, if it passes 120°E longitude south

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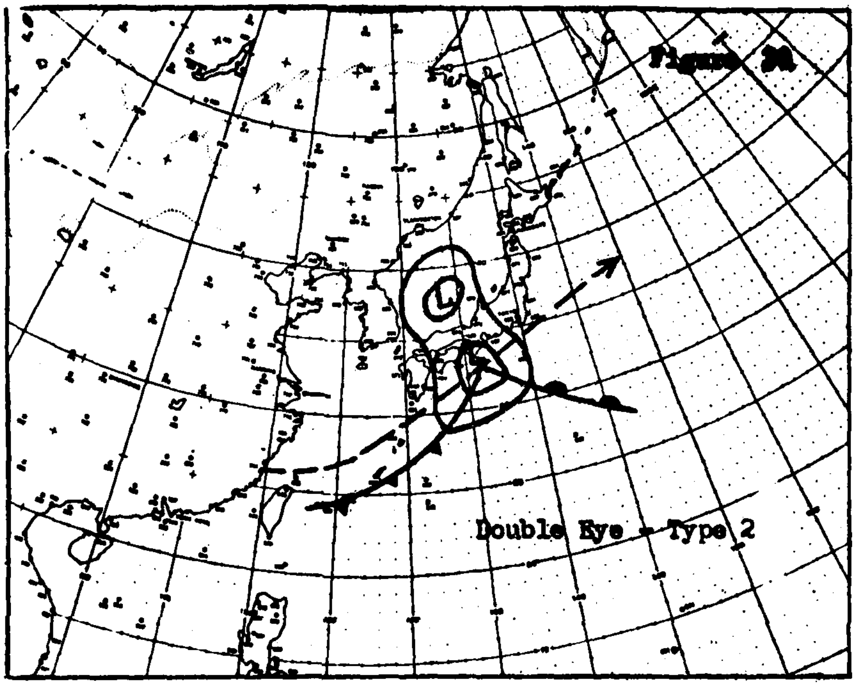
of 30°N it will be a type II and if north of 30°N it will be a type III. However, the latitude of the main polar front or trough, the position of the Asian high, and the upper level steering pattern must also be given full consideration.



IV. Weather Type IV

1. The main features of a type IV situation are:

a. A "warm" core Siberian high.

b. A minimum of frontal activity over East Asia and the Northwest Pacific.

The "warm" high is quasi-stationary with a sea level pressure intensity of greater than 1050 mb and with a closed anticyclonic circulation extending to at least 500 mb. Type IV therefore, is a blocking high situation so that westerly troughs and fronts are steered far to the north and have no effect over Japan and the areas of interest (See Figure 31).

2. Type IV patterns occur primarily in winter and in late fall and early spring. The polar front has moved far south along a line

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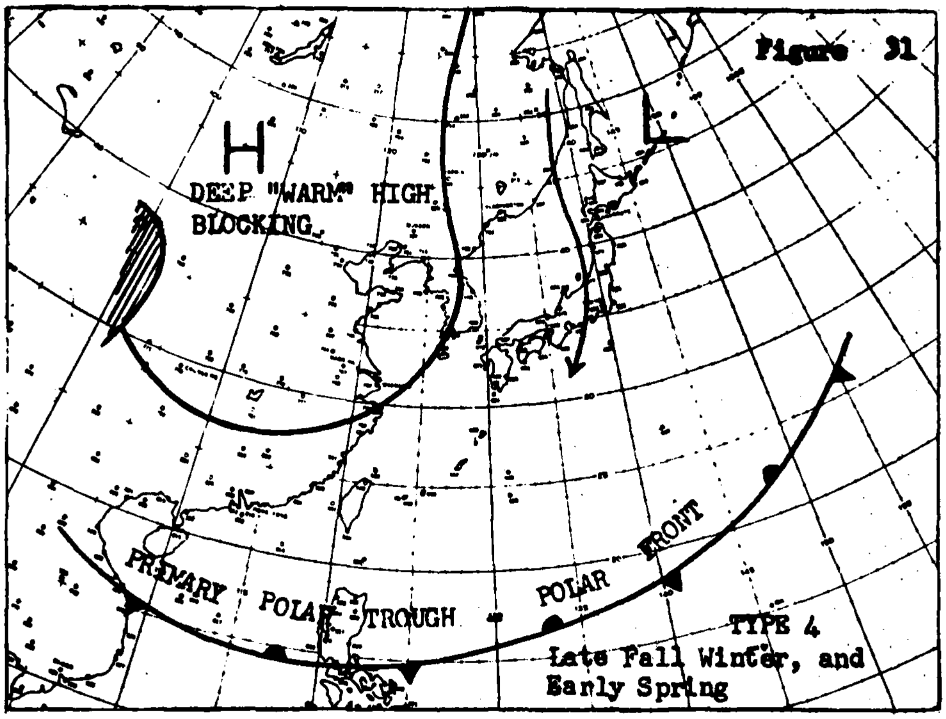
from the Philippines to the Marianas and the entire East Asian-Northwest Pacific area is dominated by the high. As with most blocking cases, type IV is a rather persistent feature and when identified, can provide the basis for a reliable forecast for several days.

3. The weather associated with type IV is generally good. However, individual terminals must, as always, be considered on the basis of trajectory of the air mass, terrain, sea temperatures, etc. The windward side of Honshu, in particular, will have extensive and heavy cumulus and very much snowshower activity. There is likely to be much above-average cumulus activity and turbulence over the seas south and east of Japan.



V. Weather Type V

1. The principal feature of type V is a frontal system or trough to the west moving eastward across the East Asian-Northwest Pacific area, (See Figure 32). It differs from type I in that the trough or front can be identified at the surface as it moves eastward and usually acts as the "divider" between successive migrating highs.

2. Type V occurs with a high frequency during all seasons and is often associated with one of the other types. It frequently acts as the "trigger" mechanism to induce wave cyclogenesis over China for type II

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and type III lows. Occasionally, variations of the type V occur in which a secondary low forms along the front or in the trough south of the primary type V low center. These secondary low centers may move on an easterly track or divert south over Korea or Japan, (See Figure 32), in unusual cases.

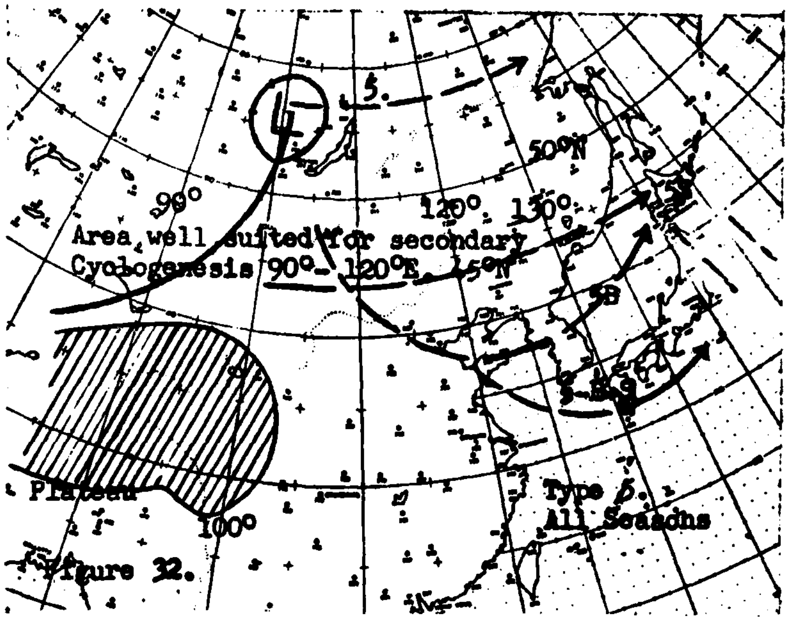

Figure 32.

3. The weather associated with type V depends on the season, the air mass contrasts, and the circulation intensity. Since type V is a west to east moving system, the major effects are found on the windward exposures. The typical or "model" weather associated with cold fronts and troughs at similar latitudes over other areas of the world are found here also. This weather cannot be generalized.

VI. Weather Type VI

1. The distinguishing features of a type VI situation are:

a. The northward flow of mT air around the western lobe of the Pacific high.

b. A high cell in the Sea of Okhotsk area which has a low level flow of mP air westward along its southern boundary.

c. The polar front or trough oriented approximately East-West forming the boundary between the mP and mT air (See Figure 33).

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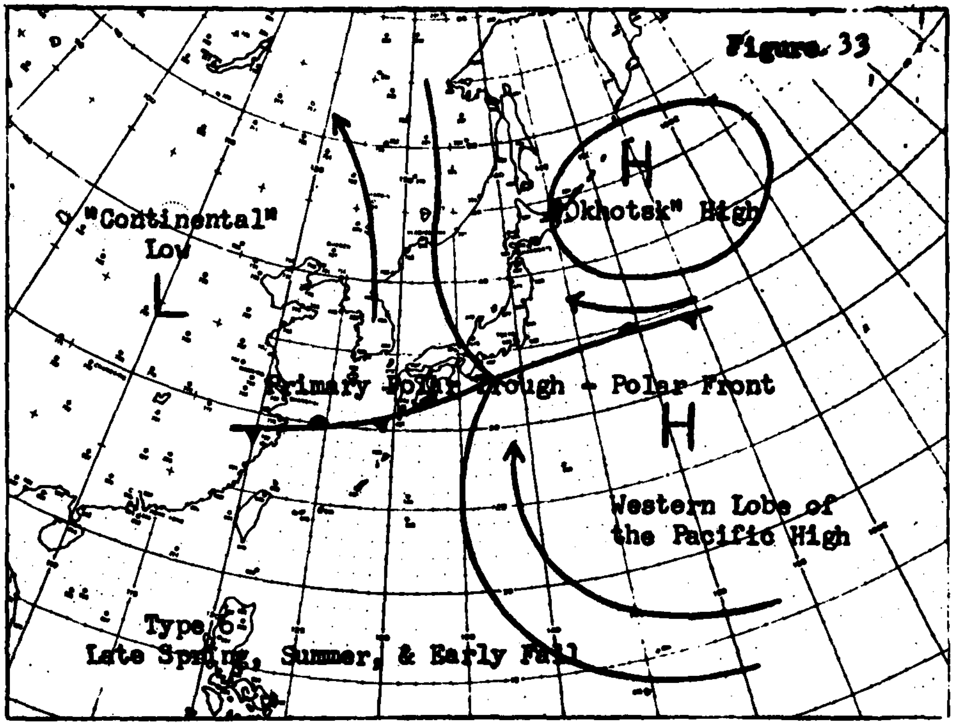

2. Type VI is a late spring, summer and early fall occurrence. The Okhotsk high is a migrating high from China or Mongolia, a southward extension of a high over Eastern Siberia or the Bering Sea, or a new feature produced by anticyclogenesis over the cold sea of Okhotsk in late spring. It may or may not be persistent. The polar front or trough will normally be located south of Japan through early July and north of Japan during late July and August.

3. Large areas of low cloudiness and rain occur with weather type VI north of the polar front. This type is prevalent during the "Bai-U" of "Plum rains" in late June and July. With a shallow mP airmass, the overrunning mT airmass causes the unfavorable weather to extend far to the north. South of the frontal boundary, mT airmass weather predominates.

VII. Weather Type VII

1. The main feature of this type is a migrating high that moves from the interior of Asia across the mid-latitude coastal area and into the Pacific, (See Figure 34).

2. Type VII occurs primarily in spring and fall. It occurs infrequently in winter and is rare in summer. The type is associated with a high index situation and the high can be extrapolated quite well. The type

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VII high is usually followed by a type V trough and strong consideration must be given to the possibility of wave formation to the southwest of the high cell.

3. Some unfavorable weather occurs with type VII in the return circulation on the southwest side of the high. Otherwise, this is a good weather type throughout the area traversed by the high.

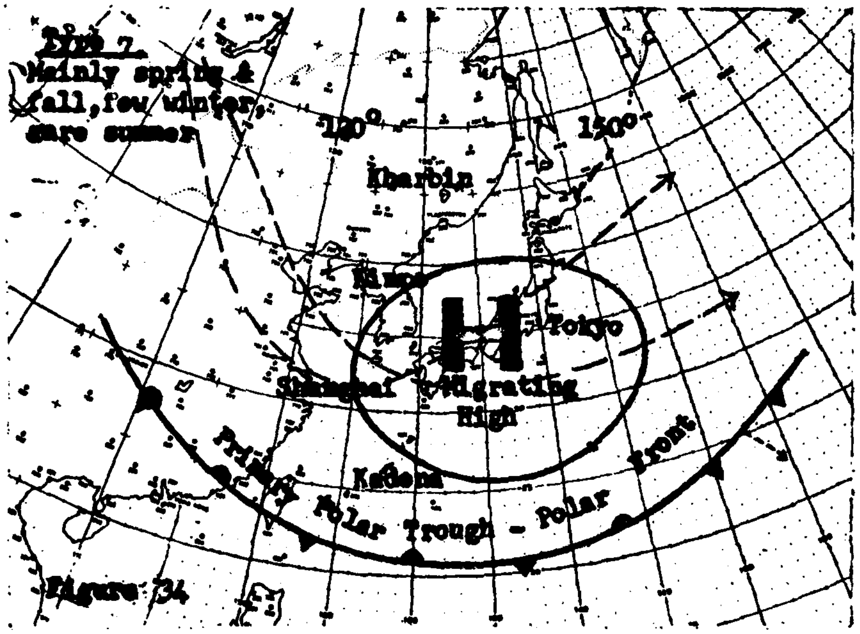

Figure 34

9. <u>JET STREAM PHENOMENA IN THE EAST ASIAN-NORTHWEST PACIFIC FORECAST AREA</u>

a. Winter:

During winter some of the stro gest winds in the world flow persistently over the Far East. Two mean et stream positions exist, (See Figure 4). The track center of th southernmost, (subtropical), jet is south of the Himalayas near 200 mb with an intensity equal to or greater than 140 knots. It extends east a northeastward across south central China and crosses the coast near Sl nghai and is associated with the southern edge of the winter polar i mass. Yeh, T. C., 1950: Tellus, 2, 273-283, explains that this jet sually has little latitudinal variation over southern China during th period (October until mid-April); after which the belts of strong we erlies begin to shift northward. The other mean jet track, usually a the 200 mb level also, is over Siberia north of the Tibetan platea curves southeastward at the plateau's eastern edge, and crosses the Chin oast at about 120°E and 40°N. It is

usually less intense than the southern jet. Yeh further explains that the northern jet is associated with migratory lows and the secondary polar frontal zone and that it fluctuates over a much larger latitudinal range, both daily and monthly, than the southern one does. A general increase in the strength of prevailing westerlies in the upper troposphere from December to February is observed with the central band of strongest winds moving to its lowest latitude in February.

Figure 35 shows a typical winter jet stream cross section along the 140° meridian. This features a pattern with one elongated jet center whose maximum winds at 34°N and 39,000 feet are 160 knots. At times a small secondary jet near 41°N is observed to accompany these winter jets. It is normal that isotachs show a more pronounced elongated pattern to the south than to the north of the jet axis at maximum wind level. Horizontal shear is greater to the north than to the south. Winds above 100 knots are observed between 30,000 and 50,000 feet at latitudes between 28°N and 38°N. At the maximum wind level of 40,000 feet, 100 knot winds are persistent over areas between 25°N and 40°N.

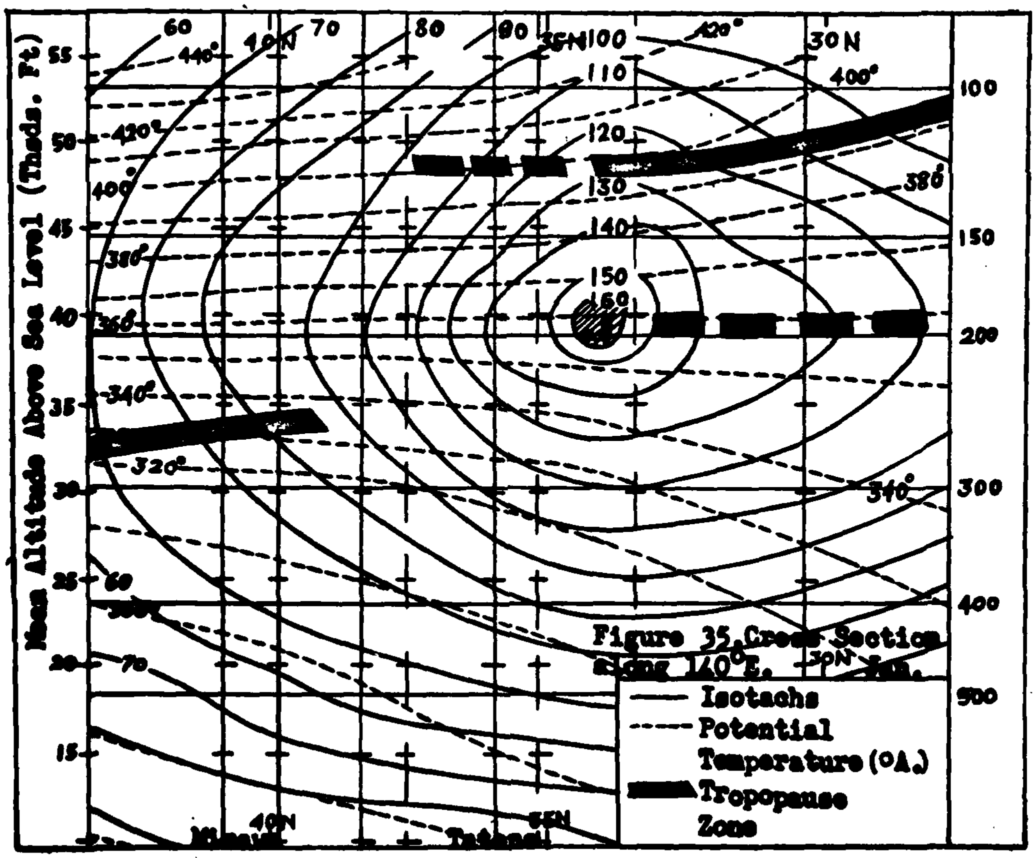

Figure 35. Cross Section along 140°E. Jan.

A study of the mean temperature and tropopause distributions around the jet stream is important. Figure 36 shows these phenomena along the 140°E meridian for January. Distributions for December and February are similar. This chart shows:

1) The greatest temperature slope, which is downward to the north, exists below the jet center between 30°N and 40°N. The potential temperature lines, (compare Figure 36 with Figure 35), slope in the opposite direction and their greatest horizontal gradient lies below the jet center.

2) That above 200 mb from 35°N to 25°N is a region of very cold air which has temperatures ranging from -60°C to -75°C. This is the cold tropopause region. The vertical packing of potential temperatures above 50,000 feet south of 35°N is noteworthy.

3) Between 25,000 and 35,000 feet northward from 40°N is another region of relatively cold air. Here, temperatures range from -50°C at 40°N to -55°C at 50°N. This is the polar tropopause region. A pronounced concentration of potential temperature lines is evident above 30,000 feet.

4) Above 35,000 feet and between 40°N and 50°N a warm "pocket" of polar stratospheric air can be found. Temperature profiles computed to greater heights and farther north suggest that this deep layer of air which is relatively warm, has a nearly isothermal lapse rate, and tends to persist as high as 20 km and to 70°N. The polar tropopause slopes upward from 29,000 feet at 50°N to 35,000 feet at 40°N with a mean temperature of -52°C. The upward slope from north to south is characteristic on monthly mean cross sections. Between 40°N and the jet center no tropopause normally can be identified as this is generally the tropopause "break" region. The tropical tropopause slopes upward from 47,000 feet at 34°N to 55,000 feet at 25°N. The broken tropopause zone shows an extension which is not pronounced in the temperature pattern or in the mean temperature curves. At times just south of the jet center there is an indication of a weak tropopause, which is an extension of the polar leaf.

b. Summer:

The strongest wintertime jet over the world becomes a poorly defined weak zone of maximum westerlies by July. Figure 37 shows a mean cross section along 140°E which is representative for the summer season. Even though the centers of mean maximum west winds over the Far East are less than 60 knots in summer, they are referred to as jet streams. The main feature of this cross section is the separated double jet center pattern. These two jets are frequent south of 50°N during spring, early summer, and autumn.

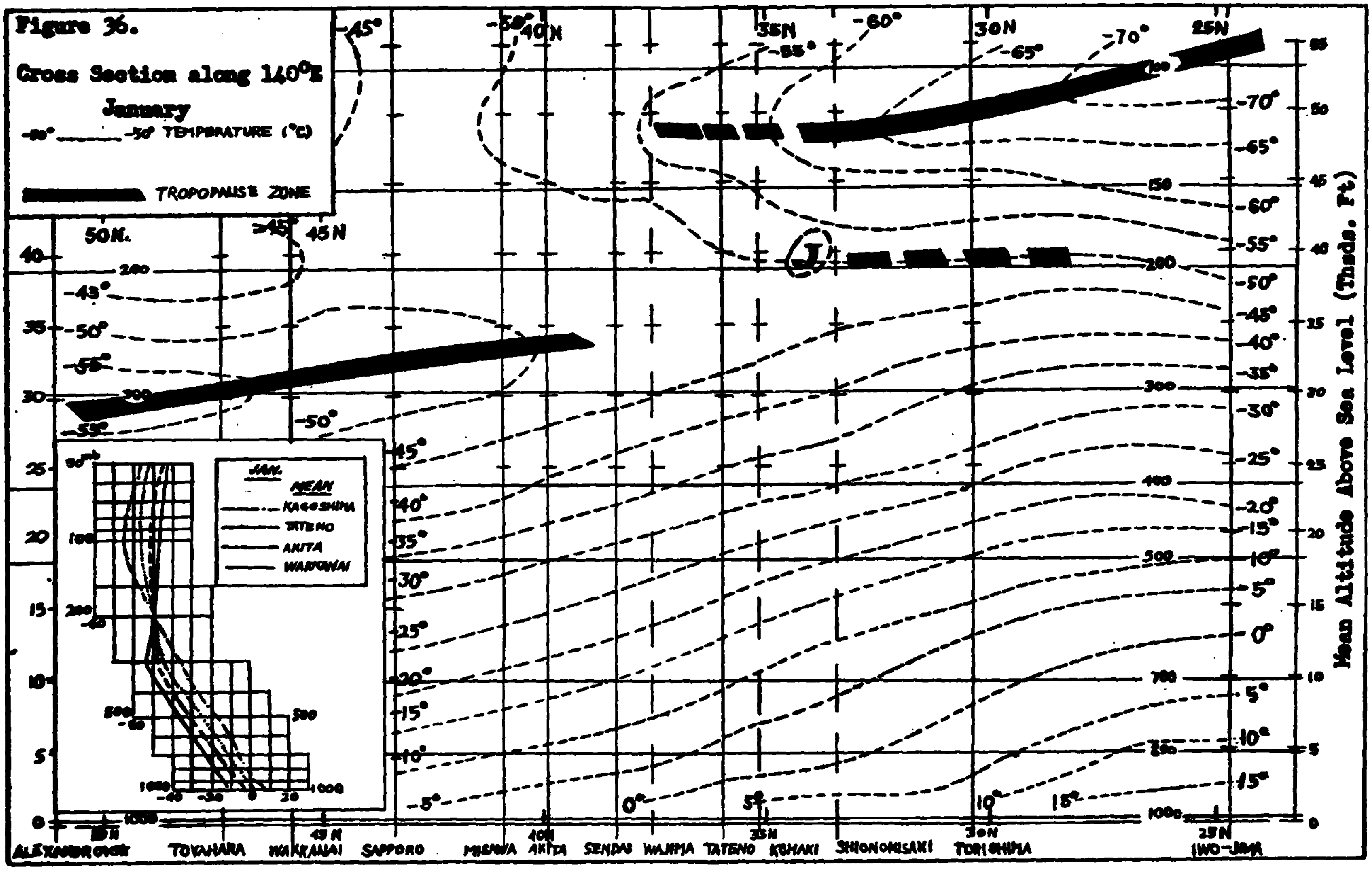

Figure 36.
Cross Section along 140°E
January

The subtropical jet is the stronger of the two, and it shifts slowly northward where it reaches its maximum height of 45,000 feet at 38°N in July. Mean values of its intensity are 60 knots over Japan and 50 knots over Korea. Areally, (See Figure 37), the region of speeds equal to or greater than 50 knots is much smaller than shown for January, (See Figure 35). In July the polar jet appears as a relatively weak zone of maximum westerlies at about 40,000 feet over areas between 45°N to 50°N.

An indication of the distribution of temperature, ($^{\circ}$C), and the tropopause zones for July is shown in Figure 38. The mean temperature curves above 500 mb for five stations are contained in the inset in the lower left corner. In contrast to winter is the well emphasized decrease in the northward temperature gradient below 200 mb. Above 200 mb and south of 35°N there is little change in the temperature field from summer to winter. North of 35°N, however, temperatures are colder in summer between 200 and 100 mb. Greatest summer temperature gradients are observed between 35°N and 40°N in the vicinity of the subtropical jet.

It is important to emphasize that the polar tropopause is located at a higher altitude in July than in January. It is usually located near 200 mb south of 50°N in summer with a mean temperature of -50°C. The tropical tropopause is usually located as far as 40 to 45°N in July. It is also highest over the Far East during this time of year with an average height of 50,000 feet between 40°N and 35°N, sloping upward to 55,000 feet at 25°N. Tropical tropopause mean temperatures for July range from -60°C to -75°C. (See Figure 38).

c. Spring and Fall:

Large changes in the wind and temperature fields often occur during spring, March to May, and during autumn, September to November, in mid-tropospheric layers. Even though there is considerable variability in the spring and autumn jets, some characteristics which show up on mean cross sections also appear frequently from day to day.

The most outstanding feature on most cross sections is the existence of two jet centers of maximum wind speed for all spring and autumn months except March, which has the winter type. The southern jet is located above the intersection of the polar front with the 500 mb surface. In spring the core is located at heights between 200 and 150 mb and situated between 32°N and 35°N. Mean maximum speeds decrease from 140 to 100 knots as spring advances. This jet is less intense in September than the polar jet is, and persists at levels between 40,000 and 45,000 feet where it migrates slowly southward with autumn's progression. Its mean maximum speed increases from 70 knots in September to 140 knots in November.

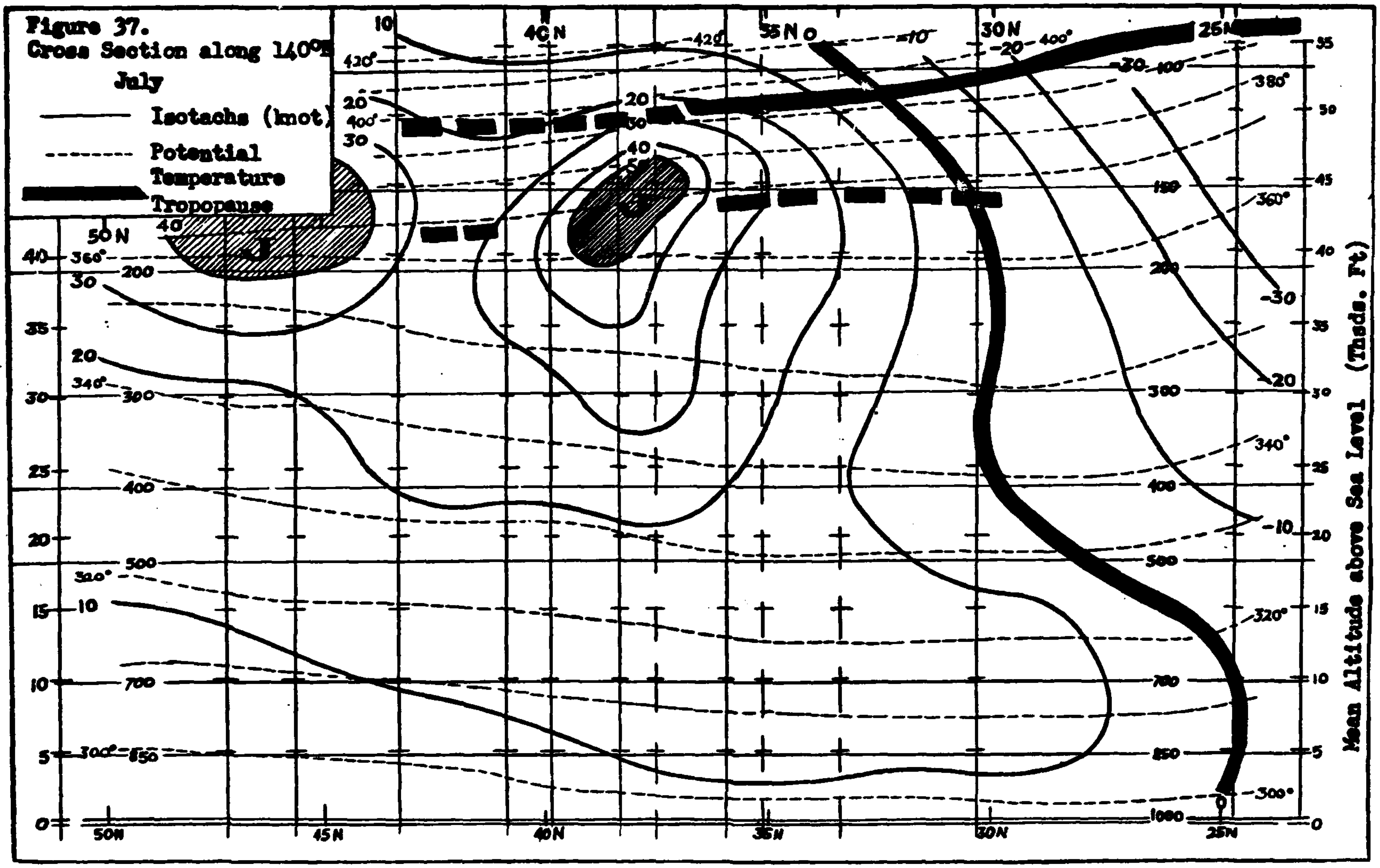

Figure 37.
Cross Section along 140°E
July

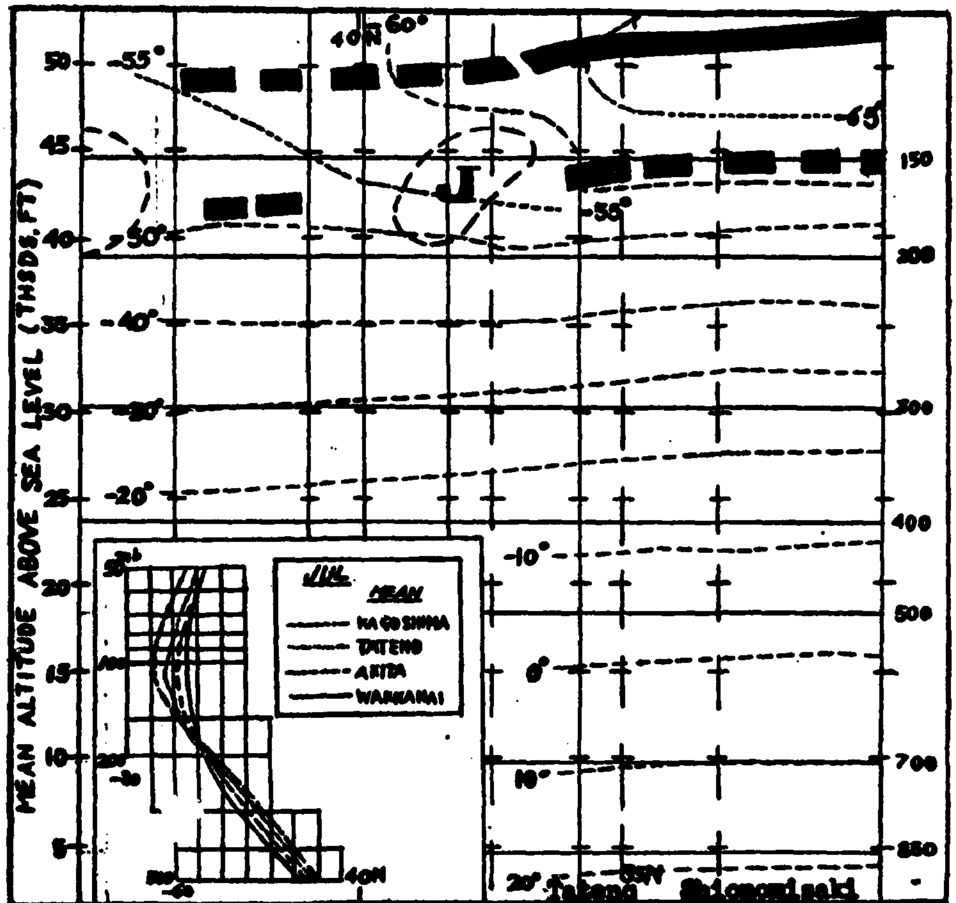

Figure 38. Cross Section along 140°E July

The polar jet position varies over a much wider latitude range from month to month than the subtropical jet does. Generally, the polar jet core can be found between 40°N and 45°N and from 35,000 to 40,000 feet during spring and autumn. Its maximum speeds of autumn, 90 to 110 knots, are persistently stronger than those of the spring months of April and May, 60 to 100 knots.

d. The Jet and Surface Lows:

The subtropical jet which flows around the southern edge of the Himalaya mountains in winter rather closely delineates the paths of migratory low cells from the east coast of China to beyond 140°E longitude. Most of these southeast Asian lows are generated near the China coast and intensify most rapidly after passing 135°E longitude where they are usually on the poleward side of the winter jet stream axis.

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The mean polar jet path which crosses southern Siberia and converges with the subtropical jet over the Yellow Sea during winter is situated south of the mean path of the Siberian lows. Even so, it is believed that good correlation exists between the mean path of lows and the jet trajectory since individual polar type jets migrate from higher latitudes southward into the jets mean track over Japan following cold air outbreaks.

In summer good correlation exists over Japan and Korea between the mean jet axis and trajectories of prevailing storms. However, far to the north, lack of data prevents determination of correlation of jet and storm tracks.

It is worthwhile to analyze and study major day to day variations in the position and intensity of jet streams in addition to understanding jet stream extremes and their occurrence. Irregular or anomalous jet stream behavior may be observed during any month, but it occurs most frequently during spring and autumn, (See Figures 5 and 9 for April and October jets). Rapidly changing surface synoptic conditions are well reflected by swiftly changing upper tropospheric patterns. It is important to remember that when a migratory low deepens, the jet stream aloft over it generally intensifies and descends to a lower height. At times, when an upper ridge of high pressure moves over a region, the band of maximum westerlies ascends, its speed decreases, and multiple jets can be found when polar outbreaks occur. As each situation passes, the synoptic pattern returns to normal. Polar jet streams rarely show mean pattern characteristics on any given day, although the subtropical jet is remarkably uniform.

e. Further Jet Stream Characteristics:

The following general statements concerning jet stream and tropopause features have been collected and are included for information and guidance:

1) During late spring, early summer and early autumn the subtropical jet most often lies above the 18,600 to 18,800 ft 500 mb contours while the polar jet usually lies above those of 18,200 to 18,400 ft.

2) During fall, winter, and spring the subtropical jet most frequently lies over the section of 500 mb isotherms between -10°C to -15°C; while the polar jet is generally over 500 mb isotherms between -15°C to -20°C, (spring and fall), and those between -20°C to -28°C in midwinter.

3) Polar jets are often related to polar fronts. In such cases the jet center usually lies over or slightly south of the 500 mb frontal position, especially after fresh polar outbreaks from Siberia.

4) Winter mean jet stream speed is 155 knots. The daily range of maximum wind is between 120 and 250 knots. Higher speeds generally occur with jets located between 30°N and 35°N.

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5) In rare instances jet intensities may reach values of 150 to 200 knots following the genesis of a well defined low north of Japan in summer.

6) The subtropical jet's mean intensity during spring and autumn is about 120 knots with mean monthly ranges from 70 to 140 knots. The polar jets mean speed during these seasons is 100 knots and its monthly values range from 60 to 110 knots. From day to day jets have values which vary between 50 and 200 knots.

7) Greatest wind shear, (100 knots/100 miles or 50 to 80 knots per degree of latitude) is usually observed on the north side of the jet, but occasionally it is as strong to the south. South side shear usually has ranges of up to 100 knots/300 miles. Clear air turbulence can be expected with the higher shear values.

8) Vertical shear is generally strong below intense jets. At 10,000 to 15,000 ft levels below jet centers values of 50 knots/thousand feet occur at times and this is especially true in the vicinity and above the polar front.

9) During all months the strongest jets are associated with cyclogenesis or the movement of a pronounced Low across the 130° and 140° meridians. The strength of the jet increases quite markedly over regions west of the surface position of such a low. As a rule, the more intense the low is, the greater will be the maximum wind speeds in the trough of the upper troposphere.

10) Jet streams with center speeds of 50 to 100 knots greater than the monthly mean often overlay regions dominated by surface highs with their attending good weather.

11) Minimum speeds or weak jets are usually associated with well defined ridges aloft. In such cases the center of maximum winds may be displaced vertically with below-normal speeds; or the horizontal axis of maximum winds may be displaced northward and above-normal maximum winds will be found beyond the top of the ridge far to the north.

12) Jet stream turbulence is most prevalent between 400 and 300 mb levels. It is usually experienced along the northern side of the jet in the cold air where there is a maximum packing of isotherms. It is more apt to be felt with jet velocities ranging from 50 to 90 knots rather than with ones greater than 100 knots. A secondary region of turbulence is normal in the layer between 250 and 150 mbs and is prevalent south of the jet maximum.

The following "jet" references were used:

1) 1st Weather Wing Special Study 105-1, "Far East Climatology of the Jet Stream", September 1955.

2) Rossby, C.G., 1936: "Dynamics of Steady Ocean Currents in the Light of Experimental Fluid Mechanics", Papers Phy. Ocean Meteor., Mass. Inst. Tech. & Woods Hole Ocean Instn., Vol V, No. 1.

3) Palmen, E., 1948: "On the Distribution of Temperature and Wind in the Upper Westerlies", J. Meteor., 5, 20-27.

4) Palmen, E., 1951: "The Aerology of Extra-Tropical Disturbance", Compendium of Meteor., pp 599-620.

5) Namias J., 1947: "Typical Nature of Some Fluctuations in the Speed of the Zonal Circulation", J. Meteor., 4, 125-133.

6) Clapp, P. F., 1949: "Confluence Theory of the High Tropospheric Jet Stream", J. Meteor., 7, 330-336.

7) Jones, J. J., Col. 1951: "The Physical Cause of the Jet Stream in the Japanese Area", 2143rd Air Weather Wing, Tech Bull I, 4-21.

10. TYPHOONS OF THE WESTERN PACIFIC

Forecasting the movement and intensities of typhoons in the Western Pacific presents a most formidable challenge to forecasters in this area. Because of the widespread destruction caused by gales, flooding, and high tides, much spectacular publicity results from their occurrence.

Since it would be nearly impossible to cover the complex subject of typhoons briefly and do it completely in this study, only a very short climatological discussion and a brief review of some of the aids and techniques which have been developed and tested are given.

A review of the subject should begin with a study of the climatology. From a 12 year period of record, it is shown that typhoons have occurred during every month of the year in the Western Pacific. However, the typhoon season is generally considered as the period from June through December when at least one typhoon per month can be expected. They are a great hazard in the Japan area between July and October with their greatest frequency here during early September. This month also has the greatest typhoon frequency for the Pacific as a whole and the highest probability of occurrence. The number of typhoons per month varies from zero to five; and the 12 year period of record shows yearly totals which vary from as few as 11 to as many as 20.

While the entire vast area of the tropical Western Pacific is the genetical area for typhoons, they are most often born south and southeast of Guam. Past courses show that while many typhoons first move northwestward in the tropical zone, recurve northeastward at latitudes

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near 25°N., and then proceed into the temperate zone; others go westward without appreciably changing their course.

Various methods such as steering by the double space mean field, Arakawa's statistical method, etc., are used by the Joint Typhoon Warning Center at Guam. It is not feasible to employ them in detachments of limited staff. Local forecasters should concern themselves primarily with the effects of typhoons passing near their station.

Although each typhoon presents a new problem, a review of previous storms and their effects can be of value. These records are available in the annual post analyses of typhoons and tropical storms (1959 - 1968), published by the Joint Typhoon Warning Center.

SECTION D

RULES-OF-THUMB (ROTs)

DET 18 HAS NO APPROVED ROTs

pg 1

SECTION E

FORECAST STUDIES

DET 18 HAS NO APPROVED FORECAST STUDIES

SECTION F

CLIMATOLOGICAL DATA

CLIMATIC CALENDAR-REPUBLIC OF KOREA

MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB
SPRING			SUMMER			AUTUMN			WINTER		
NORTHWEST MONSOON	TRANSITION PERIOD		SOUTHWEST MONSOON (7)				TRANSITION PERIOD	NORTHWEST MONSOON			
YELLOW WIND (2)		LATE FROST (3)	RAINY SEASON (BAIU)		BONIN HIGH PREDOMINATES	24HR PRECIP EXCEEDED 12 INCHES DUE TO TYPHOON	UNDER INFLUENCE OF MIGRATORY HIGH, ELONGATED EAST-WEST MEAN TRACK ALONG (10) 38°N			HEAVY SNOW MAY BE EXPECTED ALONG	
FOEHN (1)			POLAR FRONT SOUTH OF ROK	HEAVY RAIN (8)				EASTERN MOUNTAIN RANGE WITH STRONG NORTH TO SOUTH PRESSURE GRADIENT (HIGH TO NORTH)			
BLOCKING DUE TO SLOW MOVING MONGOLIAN HIGH RESULTS IN CUT OFF LOW OVER YELLOW SEA			PRESSURE HIGHER TO EAST	HIGH PRESSURE AREA TO SOUTH LOW TO NORTH				HIGH PRESSURE AREA TO WEST LOW TO EAST			
KOREA UNDER INFLUENCE OF MIGRATORY HIGH (4)			TYPHOONS MAY AFFECT REPUBLIC OF KOREA (9)				EXCEPTIONALLY GOOD VISIBILITY OVER LONG DISTANCE WITHIN MIGRATORY HIGH AREA (11)			"3 COLD AND 4 WARM DAY CYCLE" PREVAILS OVER KOREA.	
GUST WINDS (5) / TAIWAN LOWS	FRONTAL THUNDER STORMS DURATION 1-2 HRS, UP TO TWICE PER MONTH. (6)		AIRMASS THUNDERSTORMS, 5—10 KM DIAMETER; 2—5 PER MONTH			FRONTAL THUNDER-STORMS, 0-2/MONTH		SHANGHAI LOW MAY DEVELOP AND AFFECT ROK		TAIWAN LOWS FREQUENTLY AFFECT ROK	
	ADVECTION FOG, MOST FREQUENT IN JULY OVER INCHON AREA. FRONTAL & RADIATION FOG MAY OCCUR OCCASIONALLY.				RADIATION AND FRONTAL FOGS OCCUR FREQUENTLY, HOWEVER DURATION IS SHORT. RADIATION FOG SEEN INLAND.					SIBERIAN AIRMASS DOMINATES KOREA	

(1) NORTH CHINA CYCLONE PASSING OVER N. KOREA CAUSES FOEHN (HOT DRY SOUTH TO EASTERLY FLOW) OVER WEST AND CENTRAL SECTORS OF ROK.

(2) MONGOLIA CYCLONE PASSING OVER S. MANCHURIA CAUSES YELLOW WINDS (STRONG DRY WEST WIND CARRYING YELLOW DUST).

(3) LATE FROST MAY OCCUR WHEN MIGRATORY HIGH PREDOMINATES OVER ROK.

(4) MEAN TRACK OF MIGRATORY HIGH IS ALONG 33°N.

(5) LOW OVER SHANTUNG PENINSULA MAY CAUSE GUSTY WINDS OVER ROK.

(6) INTENSE FRONTAL THUNDERSTORMS IN MAY SIGNAL APPROACH OF BAIU SEASON.

(7) COOL SUMMER AND DROUGHT IF SW MONSOON WEAK AND OKHOTSK HIGH INTENSE.

(8) HEAVY RAIN LATTER PART OF BAIU SEASON.

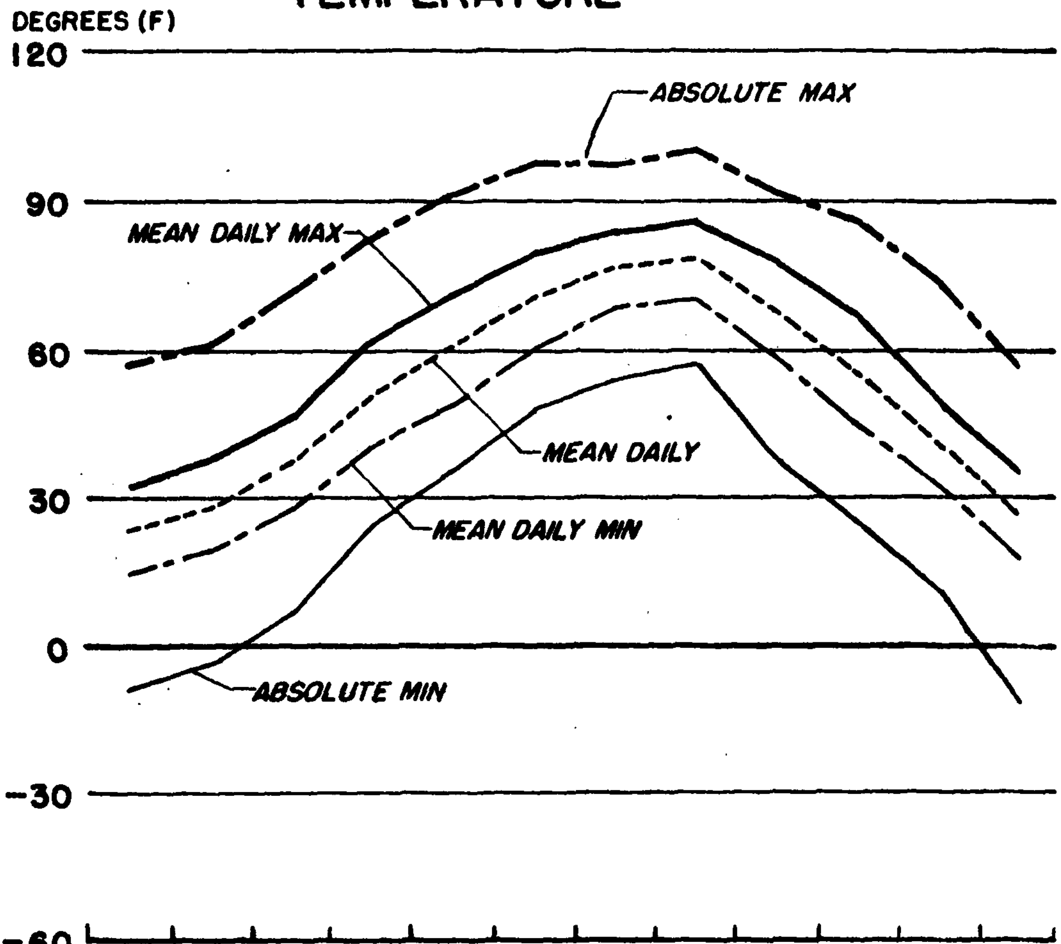
(9) HOT AND HUMID WITH MARITIME TROPICAL AIR INTRUSION. NONE OR AS MANY AS TWO TROPICAL STORMS OR TYPHOON FROM END OF JUNE THRU SEPTEMBER. MAY AFFECT ROK LEAST LIKELY IN AUGUST DUE TO BONIN HIGH.

(10) MIGRATORY HIGHS MOVE AT ABOUT 20 KNOTS, SPEEDS UP WITH NORTHWARD MOVEMENT AND VICE VERSA.

(11) OFTEN PRECEDES BAD WEATHER.

SEOUL

TEMPERATURE



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ABSOLUTE MAX	58	61	72	83	92	98	98	100	91	86	74	58
MEAN DAILY MAX	32	38	47	62	72	80	84	86	78	67	51	36
MEAN DAILY	24	29	38	51	61	71	77	79	68	56	41	28
MEAN DAILY MIN	15	20	29	41	50	61	69	71	59	45	32	19
ABSOLUTE MIN	-8	-3	7	25	36	49	55	58	38	25	11	-10

MEAN DAILY TEMP—TEMP BASED ON 3 OR MORE OBS PER DAY AVERAGED OVER THE PERIOD OF RECORD

MEAN DAILY MAX—MIN TEMP—HIGHEST—LOWEST TEMP AVERAGED OVER THE PERIOD OF RECORD

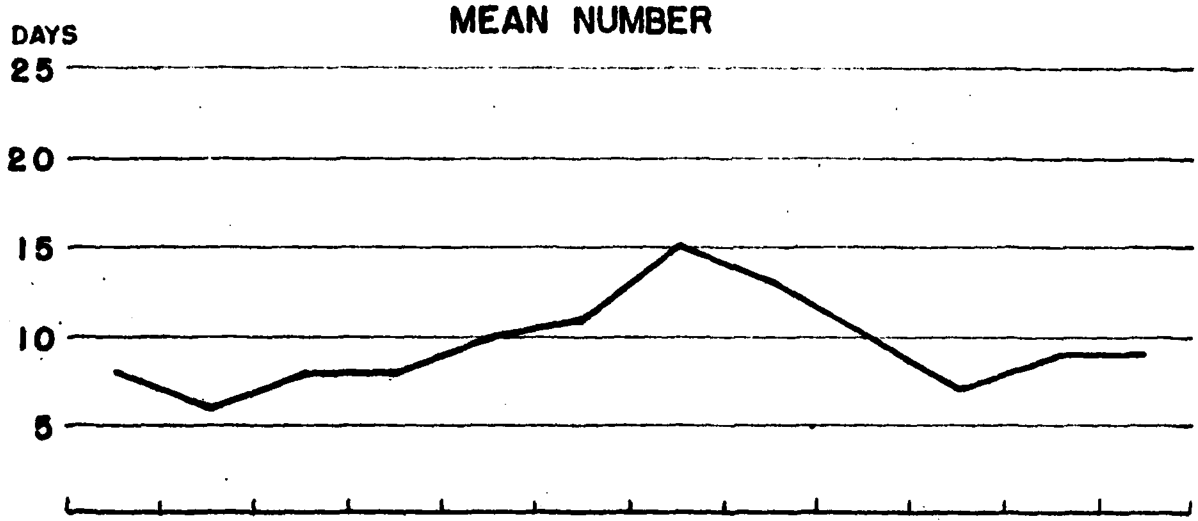
ABSOLUTE MAX—MIN TEMP—THE EXTREME HIGHEST—LOWEST TEMP VALUE WHICH OCCURED DURING THE PERIOD OF RECORD

Pg 1

SEOUL

PRECIPITATION DAYS

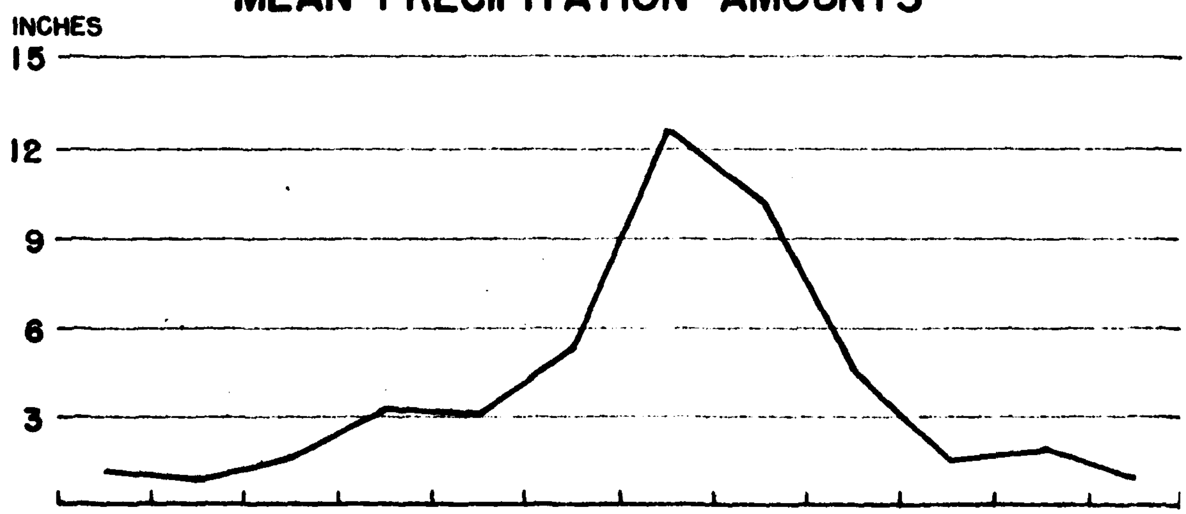
MEAN NUMBER



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DAYS	8	6	8	8	10	11	15	13	10	7	9	9

PRECIPITATION DAY —DAYS WITH PRECIPITATION ≥ 0.004 IN

MEAN PRECIPITATION AMOUNTS



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
AMT	1.1	0.8	1.6	3.2	3.1	5.4	12.6	10.3	4.4	1.5	1.9	0.8

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CB DATED AUG 68 OBSOLETE

PREPARED BY: USAFETAC JUNE 1974

STATION NAME : CAMP PAIGE AAF KOREA(CHUNCHON)
LOCATION : N37 53 E127 43

PERIOD : JUN 51-JUL 72 B
ELEV : 253

STN LTRS : RKNC
WBAN NO. : 43271
WMO NO. : 47104

AWS CLIMATIC BRIEF

MONTH	TEMP (°F) MEAN DAILY MAX	MEAN DAILY MIN	MEAN MONTHLY	EXTREME MAX	EXTREME MIN	PRECIP (IN) MONTHLY MEAN	MONTHLY MAX	MONTHLY MIN	MAX 24 HRS	SNOWFALL (IN) MONTHLY MEAN	MONTHLY MAX	MAX 24 HRS	MEAN RELATIVE HUMIDITY (%) LST 03	LST 12	MEAN VAPOR PRESSURE (IN Hg)	MEAN DEW PT (°F)	PRESSURE ALTITUDE (FT) 99.95%	SURFACE WINDS PVLG DRCTN (16 PT)	SPEED MEAN (KT)	SPEED MAX (KT) **	MEAN CLOUD COVER (tenths)	MEAN NO. DAYS: PRECIP (IN) ≥ 0.01	PRECIP ≥ 0.5	SNOWFALL (IN) ≥ 0.1	SNOWFALL ≥ 1.5	THUNDERSTORMS	FOG VSBY < 7 MI	TEMP MAX ≥ 90	TEMP MAX ≥ 80	TEMP MIN ≤ 32	TEMP MIN ≤ 00
JAN	35	16	25	52	-3	.6	.8	.1	1.2	4	7	10	74	58	.08	13	550	S SW	3	27	4	4	0	3	2	0	4	0	0	31	2
FEB	38	19	29	56	-1	2.0	4.7	#	2.1	3	12	6	76	36	.10	17	500	S SW	3	21	4	6	1	3	1	1	5	0	0	25	1
MAR	50	30	40	67	15	2.2	4.3	.3	1.6	1	2	5	80	51	.15	27	650	S SW	4	27	5	7	1	2	#	0	7	0	0	24	0
APR	65	40	53	82	28	2.6	6.1	1.0	4.0	#	#	#	81	49	.24	39	700	S SW	4	27	5	7	2	0	0	#	6	0	1	3	0
MAY	76	52	65	89	36	1.8	2.8	.5	1.7	0	0	0	85	47	.36	50	800	S SW	4	27	6	5	1	0	0	1	6	0	11	0	0
JUN	80	61	71	95	32	6.4	9.8	2.8	3.1	0	0	0	88	58	.52	60	800	S SW	4	21	7	12	4	0	0	3	7	4	16	0	0
JUL	85	68	77	99	51	16.2	20.4*	11.2	7.8	0	0	0	91	69	.71	69	800	S SW	4	21	8	17	8	0	0	2	16	9	23	0	0
AUG	87	70	79	97	53	7.2	9.6	2.1	[illegible]	0	0	0	92	68	.76	71	800	S SW	3	27	7	11	5	0	0	2	22	13	27	0	0
SEP	77	57	68	88	42	6.0	9.4	.5	6.9	0	0	0	93	63	.50	59	700	S N	3	21	6	8	3	0	0	1	23	0	13	0	0
OCT	68	43	56	82	29	3.2	4.4	1.5	3.0	0	0	1	91	57	.30	45	500	S SW	2	21	5	9	2	0	0	1	23	0	1	2	0
NOV	53	32	43	66	12	1.8	3.0	1.1	1.4	#	#	5	86	60	.19	33	500	S SW	3	27	5	9	1	0	0	0	17	0	0	13	0
DEC	39	21	30	60	5	.9	1.2	.2	.9	1	3	4	79	61	.11	20	450	S SW	2	21	4	6	#	4	0	0	11	0	0	29	0
ANN	63	42	53	99	-3	50.9	20.4	#	7.8	11	12	10	85	58	.28	45	800	S SW	3	27	6	101	32	12	3	11	140	26	92	127	3
EYR	6	6	6	6	6	9	9	9	9	9	9	9	11	16	16	16	15	16	16	16	15	9	9	9	9	6	6	6	6	6	6

REMARKS: RUSSWO POR:
HRLY OBS: JAN 51-NOV 54, APR-JUN 55,
AND APR-OCT 56, SEP 60-JUL 72
DAILY OBS:

*21.85" JUL 75

NOTE: * DATA NOT AVAILABLE. # LESS THAN 0.5 DAY, 0.5 OR 0.05 INCH, OR 0.5 PERCENT AS APPLICABLE. ** HIGHEST HRLY WIND SPEED CLASS INT. & % CALM GRTR % PVLG DRCTN

CAV FREQ (%)	HRS LST	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	EYR
CEILING LESS THAN 3000 FT AND/OR VISIBILITY LESS THAN 3 MI	00-02	7	11	9	9	5	10	22	16	9	7	15	18	11	4
	03-05	15	13	12	11	8	17	34	34	29	23	24	21	20	11
	06-08	21	20	20	19	17	27	51	49	43	45	34	24	31	16
	09-11	37	28	20	17	13	22	43	37	33	39	34	31	30	16
	12-14	17	14	12	12	8	13	31	21	11	6	16	17	15	16
	15-17	10	11	10	12	8	11	24	15	9	3	9	11	11	16
	18-20	14	13	10	11	6	7	19	13	8	5	12	18	11	11
	21-23	9	13	9	10	5	5	19	12	7	7	12	16	10	4
	ALL HRS	16	15	13	13	9	14	30	25	19	17	20	20	18	
CEILING LESS THAN 1500 FT AND/OR VISIBILITY LESS THAN 3 MI	00-02	7	8	3	2	1	2	6	9	5	5	10	14	6	4
	03-05	12	9	7	5	3	6	11	20	21	21	18	14	12	11
	06-08	18	15	11	11	9	15	25	29	32	41	27	19	21	16
	09-11	34	24	12	9	6	8	15	13	23	34	29	26	20	16
	12-14	13	8	5	6	5	5	8	4	4	4	11	12	7	16
	15-17	5	5	4	7	3	3	6	4	2	1	5	6	4	16
	18-20	12	7	4	6	3	3	6	5	2	3	8	13	6	11
	21-23	9	10	4	5	4	1	7	4	3	6	9	12	4	4
	ALL HRS	14	11	6	6	4	5	11	11	12	14	15	15	10	
CEILING LESS THAN 1000 FT AND/OR VISIBILITY LESS THAN 2 MI	00-02	3	6	2	0	#	2	3	4	2	2	7	11	4	4
	03-05	8	5	5	2	1	3	5	11	15	15	16	10	8	11
	06-08	12	9	7	6	5	9	13	22	26	35	22	14	15	16
	09-11	24	17	7	3	3	4	6	7	15	29	23	20	13	16
	12-14	8	4	3	4	1	2	3	2	2	2	7	8	4	16
	15-17	4	3	3	3	1	1	3	2	1	1	3	3	2	16
	18-20	9	4	3	4	1	1	3	2	1	3	6	9	4	11
	21-23	4	7	2	0	2	1	2	2	2	5	7	10	4	4
	ALL HRS	9	7	4	3	2	3	5	7	8	12	11	11	7	
CEILING LESS THAN 200 FT AND/OR VISIBILITY LESS THAN 1/2 MI	00-02	0	2	0	0	0	0	0	#	0	0	2	#	#	4
	03-05	2	1	1	0	0	0	#	2	4	8	7	3	2	11
	06-08	5	2	2	1	1	#	1	3	7	18	12	6	5	16
	09-11	4	1	1	#	0	0	0	#	1	6	9	6	2	16
	12-14	1	#	1	#	0	0	#	0	0	#	#	2	#	16
	15-17	#	#	#	#	0	0	0	0	#	#	#	#	#	16
	18-20	1	2	0	#	0	0	0	0	0	0	1	2	1	11
	21-23	0	6	1	0	0	0	0	0	0	0	2	0	1	4
	ALL HRS	2	2	1	#	0	#	#	1	2	4	6	2	2	

Pg3

6

CB DATED MAR 68 OBSOLETE

PREPARED BY: USAFETAC JUNE 1974

STATION NAME : TAEGU AB KOREA
LOCATION : N35 54 E128 39

PERIOD : NOV 50–JUL 72 B
ELEV : 115

STN LTRS : [illegible]TN
WBAN NO. : 43212
WMO NO. : 47142

AWS CLIMATIC BRIEF

MONTH	TEMP (°F) MEAN DAILY MAX	MEAN DAILY MIN	MEAN MONTHLY	EXTREME MAX	EXTREME MIN	PRECIP (IN) MONTHLY MEAN	MONTHLY MAX	MONTHLY MIN	MAX 24 HRS	SNOWFALL (IN) MONTHLY MEAN	MONTHLY MAX	MAX 24 HRS	MEAN RELATIVE HUMIDITY (%) LST 05	LST 14	MEAN VAPOR PRESSURE (IN Hg)	MEAN DEW PT (°F)	PRESSURE ALTITUDE (FT) 99.95%	SURFACE WINDS PVLG DRCTN (16 PT)	SPEED MEAN (KT)	SPEED MAX (KT) **	MEAN CLOUD COVER (tenths)	PRECIP (IN) ≥ 0.01	PRECIP ≥ 0.5	SNOWFALL (IN) ≥ 0.1	SNOWFALL ≥ 1.5	THUNDERSTORMS	FOG VSBY < 7 MI	TEMP MAX ≥ 90	TEMP MAX ≥ 80	TEMP MIN ≤ 32	TEMP MIN ≤ 00
JAN	39	20	30	61	-1	.8	2.9	#	2.2	4	26	22	75	56	.11	19	350	$NW	5	35	6	4	#	2	1	0	13	0	0	30	#
FEB	44	25	34	66	8	1.2	4.3	#	1.5	1	7	5	76	56	.12	23	350	$NW	5	35	5	4	1	1	#	0	11	0	0	24	0
MAR	54	33	44	78	15	2.0	6.3	.2	2.4	1	8	8	78	53	.18	32	300	$NW	5	35	5	6	2	1	#	#	13	0	0	16	0
APR	66	44	55	87	27	2.9	6.7	1.1	1.9	#	#	#	81	52	.28	43	550	$NW	5	33	6	8	2	0	0	#	13	0	1	1	0
MAY	77	54	66	99	39	2.7	4.9	.4	2.1	0	0	0	85	52	.40	53	650	$SE	6	30	6	7	2	0	0	1	14	1	12	0	0
JUN	83	62	73	101	47	4.5	14.9	1.2	3.3	0	0	0	87	55	.54	61	650	$SE	4	28	7	9	3	0	0	2	16	5	21	0	0
JUL	88	72	80	101	60	9.3	20.9	3.1	4.6	0	0	0	90	66	.76	71	700	$SE	4	27	8	13	3	0	0	5	20	14	26	0	0
AUG	90	73	81	102	59	7.1	14.6	.5	7.0	0	0	0	90	62	.79	72	650	$SE	4	30	7	10	4	0	[illegible]	6	19	18	29	0	0
SEP	80	62	71	95	43	5.0	12.8	.1	4.3	0	0	0	92	60	.56	62	600	$SE	5	25	7	9	3	0	0	1	22	1	17	0	0
OCT	70	47	59	86	31	1.7	5.6	#	2.3	0	0	0	91	52	.35	49	400	$NW	5	26	4	5	1	0	0	#	23	0	2	#	0
NOV	57	36	47	72	18	1.5	4.5	.1	1.9	#	#	#	87	57	.23	38	350	$NW	5	25	4	5	1	#	0	0	20	0	0	10	0
DEC	45	26	36	70	10	.9	2.5	#	2.2	1	7	7	81	56	.14	26	300	$NW	4	33	4	3	#	#	#	0	15	0	0	27	0
ANN	66	46	56	102	-1	39.6	20.9	#	7.0	7	26	22	84	56	.31	46	700	$NW	4	30	5	83	26	4	1	11	199	39	108	108	#
EYR	20	20	20	20	20	20	20	20	20	20	20	20	21	21	21	21	21	21	21	2	20	20	20	20	20	20	20	20	20	20	20

REMARKS: HUSSMO FOR:
HRLY OBS: NOV 50–JUN 66, AUG 66–SEP 70,
JAN 71–JUL 72
DAILY OBS: NOV 50–JUN 66, AUG–66–SEP 70

TYPHOON DATA:		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	EYR
NO. OBSVD	25NM	0	0	0	0	0	1	1	1	1	0	0	0	4	17
WITHIN	50NM	0	0	0	0	1	1	1	3	3	0	0	0	9	17
1907-67	100NM	0	0	0	0	1	2	6	5	4	0	0	0	18	17

NOTE: * DATA NOT AVAILABLE. # LESS THAN 0.5 DAY, 0.5 OR 0.05 INCH, OR 0.5 PERCENT AS APPLICABLE. ** INSTANTANEOUS PEAK WINDS $= $ CALM GRTR $ PVLG DRCTN

CAV FREQ (%)	HRS LST	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	EYR
CEILING LESS THAN 3000 FT AND/OR VISIBILITY LESS THAN 3 MI	00–02	7	11	10	14	10	13	26	15	15	6	9	5	12	
	03–05	8	11	10	15	11	16	30	18	17	7	10	6	13	
	06–08	13	19	17	22	16	21	37	26	28	20	23	14	21	
	09–11	19	19	14	18	12	16	28	20	20	12	19	17	18	
	12–14	9	12	10	15	11	13	25	16	14	7	10	7	12	
	15–17	8	12	10	14	10	13	22	14	13	6	8	6	11	
	18–20	10	14	11	15	11	14	24	15	15	6	9	8	13	
	21–23	9	11	9	16	10	15	23	16	16	5	8	6	12	
	ALL HRS	10	14	11	16	11	15	27	17	17	9	12	9	14	21
CEILING LESS THAN 1500 FT AND/OR VISIBILITY LESS THAN 3 MI	00–02	4	5	3	4	2	2	4	2	4	2	5	4	3	
	03–05	4	4	3	5	3	4	6	4	5	3	6	4	4	
	06–08	11	14	10	11	7	9	11	10	15	16	18	12	12	
	09–11	17	14	7	7	4	4	5	4	7	8	14	15	9	
	12–14	6	6	3	5	3	2	4	3	3	2	5	5	4	
	15–17	6	5	3	4	2	2	2	2	3	2	4	4	3	
	18–20	7	6	3	4	2	2	4	2	4	2	5	5	4	
	21–23	6	5	2	3	2	2	4	2	4	1	4	4	3	
	ALL HRS	8	7	4	5	3	3	5	4	6	5	8	7	5	21
CEILING LESS THAN 1000 FT AND/OR VISIBILITY LESS THAN 2 MI	00–02	2	3	1	2	1	1	2	1	2	1	3	2	2	
	03–05	2	3	1	3	2	2	4	2	3	2	4	2	3	
	06–08	8	9	6	5	4	4	5	5	9	12	12	8	7	
	09–11	10	9	3	3	2	1	2	2	3	4	8	9	5	
	12–14	4	4	1	1	1	1	1	2	1	1	2	2	2	
	15–17	4	3	1	1	1	1	1	1	2	1	2	3	2	
	18–20	4	3	1	2	1	1	2	2	2	1	3	3	2	
	21–23	3	2	1	1	1	1	2	1	2	#	2	2	2	
	ALL HRS	3	3	2	2	2	2	2	2	3	3	5	4	3	21
CEILING LESS THAN 200 FT AND/OR VISIBILITY LESS THAN 1/2 MI	00–02	1	1	#	#	#	0	#	#	#	#	1	1	#	
	03–05	1	1	#	1	#	#	#	#	1	#	2	1	1	
	06–08	2	1	1	1	#	#	#	1	2	3	5	2	2	
	09–11	1	1	#	#	#	0	#	#	#	#	1	1	#	
	12–14	#	#	0	#	0	#	0	#	0	#	0	0	#	
	15–17	#	#	#	#	0	0	#	#	#	0	#	#	#	
	18–20	1	#	0	#	#	#	#	#	0	0	#	#	#	
	21–23	1	#	0	#	#	0	0	#	0	#	#	#	#	
	ALL HRS	1	1	#	#	#	#	#	#	#	#	1	1	#	21

AWS FORM APR 74 62
PREVIOUS EDITION IS OBSOLETE.

CLIMATOLOGICAL DATA

CLIMO DATA FOR FREQUENTLY USED LOCATIONS IS LOCATED IN FORECASTER AID BOOK.

SECTION G

SYNOPTIC CASE STUDIES

CASE STUDIES - SEE TFRF BOOK # 6

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1. <u>WINTER</u> <u>NAME</u> <u>AUTHOR</u> <u>DATE</u>

   a.

   b.

   c.

   d.

   e.

2. <u>SPRING</u>

   a.

   b.

   c.

   d.

   e.

3. <u>SUMMER</u>

   a.

   b.

   c.

   d.

   e.

4. <u>FALL</u>

   a. Rainshower and thunderstorm activity, SSgt Schendel, 11 Oct 79

   b.

   c.

   d.

   e.

5. <u>SPECIAL SUBJECT</u>

a.

b.

c.

d.

e.

SECTION H

TERMINAL FORECAST WORK/PREPARATION SHEET

DET 18 DOES NOT ISSUE TERMINAL FORECASTS; THEREFORE, IT DOES NOT HAVE A FORECAST WORKSHEET. THE UNIT'S PRIMARY FUNCTION IN-STATION IS A BRIEFING FACILITY.